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MDes FINAL VISUAL PRESENTATION

By

FABIOLA GUILLERMINA NOEL

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH IN
PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF DESIGN

IN

VISUAL COMMUNICATION DESIGN
DEPARTMENT OF ART AND DESIGN

EDMONTON, ALBERTA

FALL 2006



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Visual Communication Design and Broca's Aphasia

The design of a customized game to facilitate family interaction

Fabiola Guillermina Noël MASTER OF DESIGN THESIS
Department of Art and Design University of Alberta

Visual Communication Design and Broca's Aphasia

The design of a customized game to facilitate family interaction

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Acknowledgements

My sincere thanks are for all the people who gave so generously their time and knowledge throughout the project. I would like to begin by thanking Bonnie Sadler Takach for her supervision, her invaluable comments, her detailed corrections and careful editing, her questions, her time and her incredible capacity “to squeeze” my brain. Thank you to Tammy Hopper, for her guidance, for providing me with vital information since the very beginning of the project, for patiently answering my questions, and for her kindness.

I would like to express my gratitude to all the experts interviewed and who gave permission to be named here: Robert Bringham, Alison Cassis, Roberta Chapey, Rubén Fontana, Zalma Jalluf, Monique Lindhout, Marjorie Nicholas, Silvia Rubio, Rosemary Sassoon, Merrill Semple, Ronald Shakespear, Karel van der Waarde, and other experts for their time, advice, interest, knowledge and support. I also want to thank Monique Lindhout, Merrill Semple, and Rubén Fontana for giving me opportunities to publicly present the project.

I thank Erich Rieger, Sue Gilpin, Phillip Dann, and many others for their work and example. I am grateful to Rosemary Sassoon for being so encouraging, and to Judy Cameron who showed me the potential of researching in unknown territories (and told me that there is no value in developing research on something for which you already know the answer). My thanks go also to Susan Colberg for her advice regarding the final visual presentation.

I would like to thank the library system at the University of Alberta, for having all I needed and more, Jetske Sybesma for her support, and Nancy Helm-Estabrooks for her advice.

I would also thank Louise Asselstine and David Roles, for their sustained technical assistance and support.

And finally, I thank my husband, Jorge Frascara, for his writings, his wisdom, and his books, for showing me that learning involves the ability to discover distinctions, and that a design project should have both social and professional relevance, and also for his patience, encouragement, humour, companionship, and love.

Abstract

This thesis project is about how design might create possibilities for a person with language impairments, such as loss of speech, to interact with family. The project was intended to explore how to design a conversational tool that would be accessible and usable by people with aphasia and their families.

The project began with the identification of aphasia, a language disorder caused in most cases by stroke, as an area involving communicational needs of people. The researcher recognised the loss of speech suffered by people with Broca's aphasia and the consequent lack of interaction with others as an important problem. To address this, the researcher proposed the design of a board game to increase opportunities for people with Broca's aphasia to interact with family, and with language, through exposure to written and spoken words in the form of brief questions and answers.

Given the variety among aphasia cases, the project focused on one specific case. Using a user-centred design approach, two game prototypes (named after the names of the fonts used), *Goudy* and *Century*, were designed (each prototype was designed both in English and in Spanish, given that Spanish is the language of the intended user and his family. It means that four game prototypes were created). The prototypes were evaluated by eight experts in aphasia and nine experts in design during interviews. The aim of the expert interviews was to collect experts' opinions about the prototypes before creating a final design.

Overall, responses by the experts in aphasia and in design supported the design strategy about game playing as an activity to facilitate family interaction and the importance of customizing a conversational tool for a specific person who suffers from aphasia.

A conversation with the intended user, and his interaction with the prototypes, showed that a board game could potentially increase opportunities for people with Broca's aphasia to interact with their families.

1 | Introduction

*In this thesis document,
I will refer to myself as the
designer or the researcher.*

This Master of Design thesis project began with the identification of aphasia as an area with communicational needs for people, to which design could make a positive contribution. Visual communication design is defined as an interdisciplinary field. The main goal is not the communication itself, but the response obtained, and the impact that this communication has on the knowledge, attitudes, and behaviour of people.

The researcher recognised the language impairment suffered by people with Broca's aphasia and the consequent lack of interaction with others as important problems; and proposed game-playing and the design of a board game to increase opportunities for people with Broca's aphasia to interact with the family and with language, through exposure to written and spoken words in the form of brief questions and answers. A system was therefore created comprising: a tool, in this case a game which facilitates an activity; the activity itself, the playing of the game; and the interaction of the family which is facilitated by the playing of the game. The tool, the activity and the family interaction create a situation, structuring the environment in a certain way. If the system is altered, interaction might not be facilitated.

Given the variety among aphasia cases, the project focused on one specific case. AM is an intellectual in his seventies who suffers from Broca's aphasia.

The idea of using a game to address AM's problems was a design decision based on the analysis of the aphasia problem, on the potential of games to facilitate interaction, and on the user's profile. The development of the game involved the application of design knowledge and principles.

The main objective of the game was to increase AM's opportunities to interact with family members. Thus, the game *Questions & Answers* was created considering AM's abilities and disabilities so that he could be a successful player, and AM's interests so that he would be motivated to play. In design, we call this approach user-centred design, a design process that pays fundamental attention to the needs, wants and possibilities of the user, as well as the situation of use. This kind of approach to design is critical when working with specific needs, and with a disorder like aphasia which varies from case to case.

Key elements of the research question and subquestions, that result from the background research, were extracted and transformed into statements. These statements guided the development of the interview questions and the design response. Two *Questions & Answers* game prototypes, *Goudy* and *Century*, were designed to assess size, format, colour, typeface selection, and other design decisions before the final design.

Interviews were held with leading experts, people recognised internationally in their fields for their substantial publication records or professional activities. Eight experts in aphasia and nine experts in design were consulted for their opinions about the prototypes. The researcher travelled to New York and Boston (USA), Reading and Seven Oaks (England), Örebro (Sweden), Amsterdam and Arhem (Holland), Frankfurt (Germany), Bruxelles (Belgium), and Buenos Aires (Argentina) to interview the experts. The two game prototypes were produced in English and Spanish. Four interviews were conducted in Argentina, in Spanish, and were translated by the designer into English for this thesis. Overall, responses by the experts in aphasia and in design, supported the effectiveness of the design strategy. A conversation with the intended user, and his interaction with the prototypes, showed that a board game could increase his opportunities to interact with his family and with language, through exposure to written and spoken words.

Applying the concepts learned, and outside the scope of this thesis, two other games were designed for the intended user: a pairing domino game and a matching card game. The two games were informally evaluated, through a playing session with the family. The games were successfully played and interaction was achieved. The pairing domino and the matching card game were also produced in English and in Spanish. A total of six prototypes were designed, three games in English, and three games in Spanish. The English versions of the pairing domino and the matching card games, were presented at the Annual meeting of the International Aphasia Association in Örebro, Sweden and at the Glenrose Rehabilitation Hospital in Edmonton, Canada.

The process followed could be applied to develop similar tools for other people with Broca's aphasia.

As a result of the evaluation, a set of guidelines and a series of recommendations were developed; and new areas for research were identified.

The project showed that there is a possibility for constructive dialogue between design and aphasia experts for the development of materials in different areas of the problem, such as: a) diagnosis, b) rehabilitation, and c) general interaction between the sufferers and their environment.

The project showed that in an area of highly specialised neurological problems, knowledge in visual communication design can help the development of materials and tools for people who suffer the damage.

2 | Visual communication design

Visual communication design is a relatively new area of design, depending on individual opinions about when and how it originated. The researcher understands visual communication design as an interdisciplinary field. Designers work together with medical doctors, pharmacists, biologists, lawyers, engineers, musicians, educators, environmentalists, and a long list of other professionals; they do this to create communicational situations, in response to a need. The main goal is not the communication itself, but the response obtained, the impact that this communication has on the knowledge, the attitude, and the behaviour of people (Frascara, 2004).

The researcher frequently compares design with cooking to facilitate students' understanding of the discipline. The goal of cooking is not to create food, but the effect that this food is going to have in our organism, physically (in terms of nutrition) and psychologically (in terms of pleasure and reward). Good food requires good ingredients and knowledge of how to use and combine them. Effective design requires design-specific knowledge, an understanding of cognitive, social and perceptual psychology knowledge, and production knowledge. Both cooking and design require a deep understanding of human and social elements, both demand an understanding of people, and of course the products of both have to be aesthetically pleasant and make our life easier and better. According to Frascara (2002):

The design discipline has developed in the recent years from an exclusive concentration on the design of objects, environments and communications toward an expansion of its field to include the design of processes, services, structures and systems, and to a series of activities that could be defined as the design of contexts within which traditional design operates. (p. xv)

A design project involves the use of methods, to help understand and study the design problem, and to help create a response that will change or reduce the problem identified. Every design project follows a process that basically entails: identification of a problem; collection of information related to it; analysis and interpretation of the information; conception of a design response; production; and evaluation. This process creates an iterative cycle.

The need can be identified by the designer, a client, another professional, or other people. The person identifying the need usually has a pre-conception and definition of the problem. The designer has to search for all possible information available to really understand the full spectrum of the problem,

and frequently redefine it. The information collected will not only help to better understand the problem, it will also set guidelines to develop the design response; the analysis and interpretation of the information will tell what must be done to obtain a response, it provides a frame. The conception of the design response mainly entails thinking about what media (graphic, electronic, etc.) and type of piece (brochure, poster, manual, book, website, etc.) of design to produce, how it should look, which design elements to use (materials, form, texture, colour, typography, image) and how and where it should work. The production involves the implementation of the guidelines developed, and its details depend on the media selected. In design, the practitioner has to adapt general knowledge to specific situations. This requires a broad knowledge of all problem areas – from the human to the technical – involved in the practice of design, and a good sensitivity to the particular requirements of each specific situation. Frascara (1997) stated:

Methodologically, the difficulty of graphic design is that a generic body of knowledge has to be applied to specific situations that relate to specific instances of human experience. (p. 12)

Once a project is completed, the evaluation measures the degree to which the objectives were achieved, and helps to assess the assumptions held and the decisions made during the process.

3 | Identification of an area with needs

Personal statement

It is not yet known how the brain makes possible for me to write words and sentences, for you to read them, and for us to talk or write – should we decide to meet or correspond – about anything we choose. What can be said with certainty is that the conversion of my semantic concepts into language and thence into your thoughts, and vice versa, requires a particular swathe of our brains; and if all or part of that territory is destroyed, all or part of the conversion of thought into language and language into thought will be impeded.

(Hale, 2002, p. 100)

In February 2003, my stepfather suffered a stroke that left him without speech. In order to survive he had surgery and needed to stay in hospital for a long time. My mother was always with him, but it was difficult for her to understand, or interpret what he was trying to communicate.

I was at that time in Canada, studying English to be able to apply for admission to the Master of Design Program at the University of Alberta. I had difficulties communicating with others, I felt that I appeared to be ignorant because of my restricted vocabulary. I wanted to have enough language to communicate and to be able to practice my profession again.

As a daughter and designer, I thought about developing some icons to help my stepfather and my mother to communicate with each other. My mother was talking to me about communicational needs she and my stepfather were having, and I was developing icons and sending them to her by e-mail. I designed 42 icons that for that period in hospital offered my mother and stepfather possibilities for communication (See icons in appendix A).

Once my stepfather was back home he didn't want to keep on pointing to icons, he wanted to speak. My husband, who is also a designer, and I created tiles with letters, to form an alphabet that my stepfather could use to construct sentences. He didn't want to use this tool (later, I learned that he could not use it). I was observing and participating in the communicational difficulties and changes experienced at home.

At that time I had been accepted to the Master of Design Program at the University Alberta, and I was wondering how I could help my mother and my stepfather to communicate. My knowledge was insufficient to provide an answer, and so I began my research process.

The case subject in this project is my stepfather. In this thesis text, I will refer to him as AM, the user, or the intended user. I was 12 years old when I first met him; we always shared a good relationship. Having lived several years with AM, I have come to understand his behaviours and needs, to know his abilities, intellectual profile, emotional states, and general character, and also his social network, communication motivations, activities, games and topics that he likes.

He is encouraging about the book. Says I have one great advantage over even his most dedicated graduate students: I have lived for 7 years with an aphasic. (Hale, 2002, p. 274)

I feel in a way similar to Hale; having lived for years with AM provided me with knowledge about a number of matters. Unlike Hale, I will not write a book about a person with aphasia, but will develop a project focusing on his needs.

4 | Understanding aphasia

In this section

The case

Aphasia

The social role of language

Classification of aphasia chart

This section describes the case studied for this thesis project, and outlines the need to focus on a specific individual when working in the field of aphasia. It defines and describes aphasia and the particular form it takes in the case study. It concludes noting the importance of language, and its role in human interaction.

The case

AM was an intellectual, a lawyer and a historian in his seventies when he suffered a stroke. He was well known in the community, and his main activities were to interact socially and to read. Given the amount of reading that his profession required, he had taken courses for speed reading. He used to go to the cinema and theatre, listen to jazz, classical music concerts and opera, play poker and chess, watch soccer and travel extensively. After the stroke, AM's speech was cut off, his writing abilities were erased, he lost his autonomy, his social life was gone, his professional life finished (only one of his many friends kept on visiting him), and he was full of sadness. AM was sitting at home, with few opportunities for interaction and was disconnected from his family, and when left alone he would just stare at the floor. Aphasia changes over time, after a stroke for example there could be some spontaneous language recovery. In the case of AM, over a period of three years, he went from depression to eventual acceptance of the permanent impairment. During the first year, given the depression and the language impairment, AM did not have the will to interact and participate in activities. The whole family was shocked; at that time we did not know that aphasia is a long term disability.

Aphasia

Aphasia is a communication disorder caused by brain damage that affects speech, writing, reading and auditory comprehension to some extent. A person cannot be born with aphasia, it is necessary to have some language in order to acquire the disorder.

Most aphasia cases are caused by stroke. In less than one second the language system developed in early childhood is partially or completely damaged. It is important to make clear that aphasia relates only to language, and that unless accompanied by other disorders, does not affect other cognitive functions and intellectual capacities. The number of people that suffer from aphasia in Canada has been estimated to be about 100,000. Aphasia can have a devastating effect on the individual's life and his/her entire family.

A feature of aphasia is its variety, and the nature of the impairments depends on the location and size of the lesion (see Classification of aphasia chart at the end of this section). For example, some people can pronounce only a few words, others mistake words, such as *cat* for *dog*, others cannot speak at all; some cannot read, others can read nouns better than verbs; some cannot write, others can write names, but not pronounce them; some cannot understand what the other person is saying.

This project focuses on Broca's aphasia, since it is the kind of aphasia that AM suffers. People with this kind of aphasia have their speech reduced to a few words that are pronounced with effort. Basically they cannot verbally construct a complete sentence, they can respond with one or two words, mainly nouns. They normally have trouble with words that have little meaning like articles such as *the*, or prepositions such as *on*; and have difficulties producing verbs. Writing is normally as impaired as speech. Auditory comprehension and reading are usually intact. This aphasia may be accompanied by paralysis or weakness of the right arm and leg.

Although two people can have the same kind of aphasia, the two cases can be very different. The present research concentrates on AM's case.

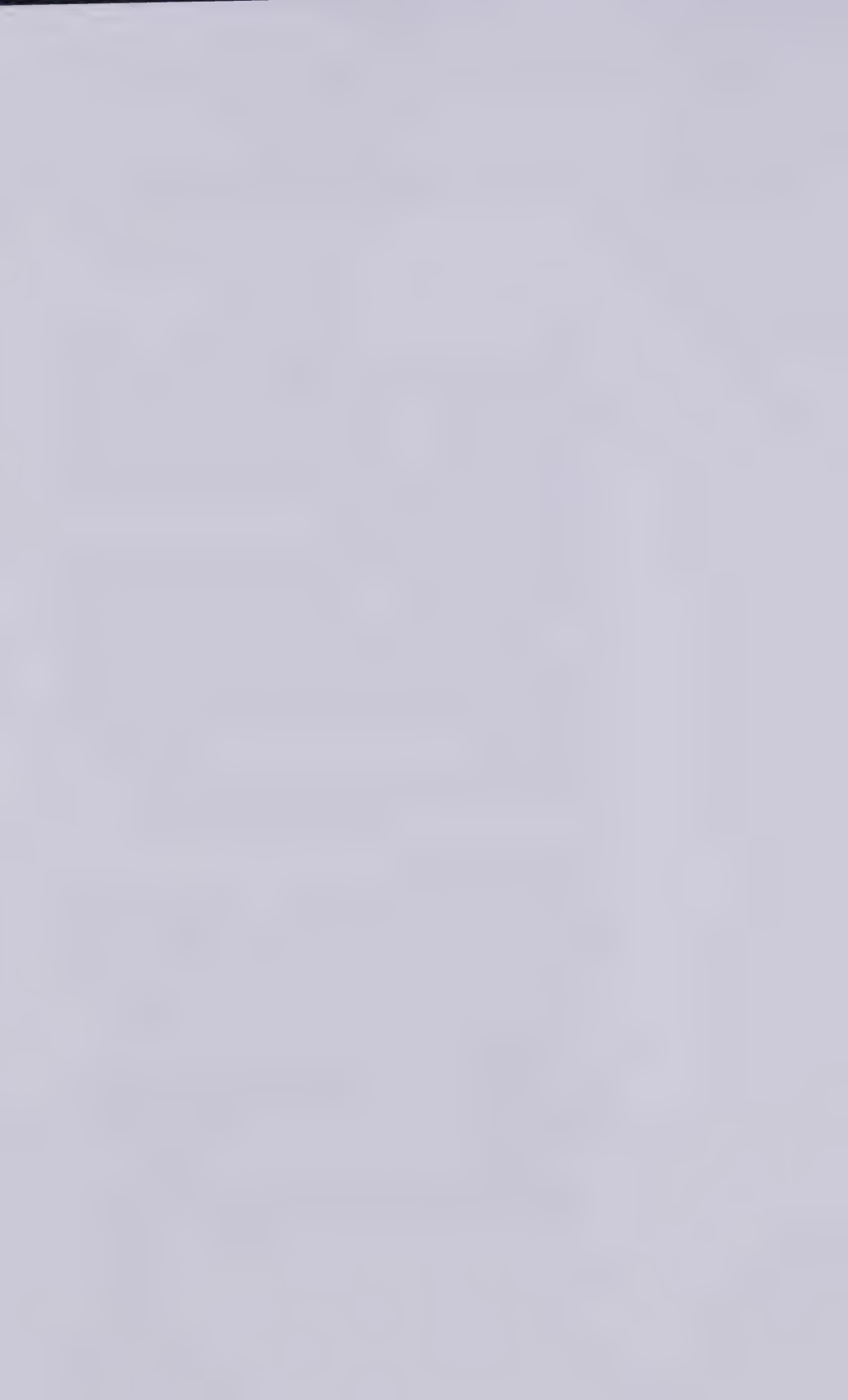
The social role of language

As already mentioned, aphasia affects language to some degree. Language, the ability to speak and comprehend, to write and read, is essentially human, and it is an important aspect of human life. Chomsky (2000) referred to language as:

The "marvellous invention" of a means to construct from a few dozen sounds an infinity of expressions that enable us to reveal to others what we think and imagine and feel. (p. 4)

The main feature of Broca's aphasia is that it impairs speech, the instrument we use to communicate with others. On the nature of speech, Greenberg (1968), explained that:

Through speech, man can bring a fellow human being to do something for him... It is indeed as a tool of social interaction and cooperation that speech most clearly confers an... advantage on man. (p. 5)



Through communication, we fulfil one of our basic human needs, social interaction. Simmons-Mackie (2001) stated that:

Through communication we express and create our ideas, and also our personalities, our culture, and our life values. (p. 247)

Accordingly, Lyon (2004) concluded that:

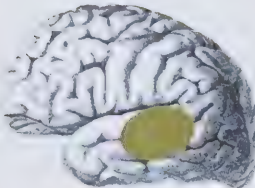
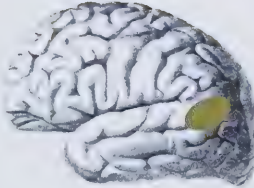
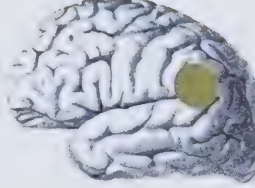
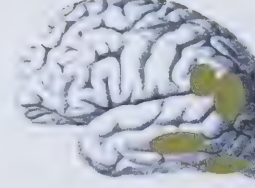
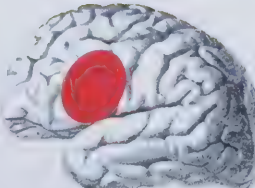
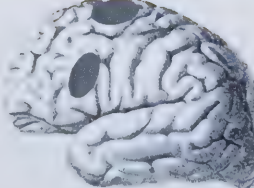
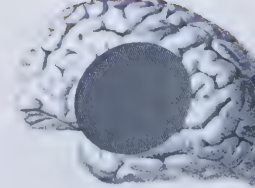
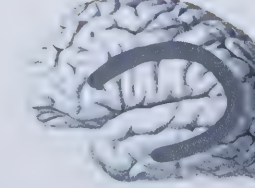
The prime role in life of verbal communication is to help organise and mediate thought..., to share those thoughts with others, and to provide a medium for interpersonal interaction. As such, talking does not serve a central function outside its connections with the process of living life... Thus, communication is more a life-conduit, channel, or interpersonal medium than a separate, isolated entity. (p. 65)

Based on the above statements, it becomes clear that Broca's aphasia may not only affect speech, but also possibilities for social interaction. As a consequence of aphasia, AM's interactions with others through language have been seriously reduced, he was at home and depressed with few opportunities for activities and interaction, and isolated from the family. The family did not know how to help, and what kind of support to offer. According to Hall (1959):

Interaction has its basis in the underlying irritability of all living substance. To interact with the environment is to be alive, and to fail to do so is to be dead. ...One of the most highly elaborated forms of interaction is speech, which is reinforced by tone of voice and gesture. (p. 38)

Hall lists interaction as one of the 10 "primary message system[s]." To recover interaction with the environment, in this specific case, the family seems to be essential.

Classification of aphasia chart

Fluent	Wernicke's	Transcortical sensory	Conduction	Anomic
	<p>Impaired auditory and reading comprehension. Repetition is defective, there are often abundant paraphasias, speech could be meaningless.</p> <p>Right visual field defect and lack of awareness of the deficit, sometimes accompanies.</p>	<p>Well-articulated speech with frequent semantic paraphasias. A key feature is auditory comprehension generally poor; naming is severely impaired.</p>	<p>Speech is fluent, but with word finding problems and phonemic paraphasias errors. The hallmark is impaired repetition of words and sentences. Auditory comprehension is relatively good.</p>	<p>Characterized by significant naming impairments or word retrieval problems. Sentences are grammatically well-formed.</p> <p>There is good auditory comprehension and repetition.</p>
				
Nonfluent	Broca's	Transcortical motor	Global	Mixed transcortical
	<p>Speech is reduced to a few words that are produced with effort, problems with grammar, and relatively intact auditory and reading comprehension. Typically, writing is at least as severely impaired as speech. Right hemiparesis is common, affecting the face and the arm.</p>	<p>Auditory comprehension is good. Spontaneous and conversational speech are severely impaired; sometimes with phonemic and global paraphasias (incorrect word choice and sound substitution), syntactic errors and difficulty in conversation.</p>	<p>Language is reduced to a few words, auditory comprehension is extremely compromised. Patients have little or no ability to communicate. They can present right hemiparesis.</p>	<p>Speech is similar to Global, sometimes with the presence of echolalia, inappropriate and irrepressible repetition of what others say. Auditory comprehension is impaired. Repetition occurs without comprehension. Right-sided weakness may be present.</p>
				

Glossary

Echolalia: inappropriate and involuntary repetition of what others say.

Hemiparesis: muscular weakness of the right side of the body.

Paraphasias: incorrect word choice, substitution of one noun for another. It could be phonemic, semantic or neologistic.

Phonemic paraphasia: substitution of one word for another similar in sound, e.g., *stoon* for *spoon*.

5 | Defining the problem

In this section

Identification of areas for intervention

Analysis of the problem

Games to facilitate interaction

The role of design in this project

In this section the general problem area is discussed and a focus is identified. The situation of a person who returns home with aphasia after a stroke is the focus of attention, and the need to facilitate interaction with others, for people who lost their speech, is outlined. Games are proposed as a possible conversational tool to facilitate interaction with others and with language. The potential usefulness of visual communication design for the development of customized games is discussed.

Identification of areas for a design intervention

A literature review helped to identify three possible areas for a design intervention. These are: a) the diagnosis of aphasia, b) the rehabilitation of aphasia, and c) when the patient returns home or to a care facility, that the designer will call “at home.”

The project will focus on the last area since it is the one in which the designer has more experience, having observed and participated in the communicational difficulties and changes experienced at home. The main problem at home is that as a consequence of the loss of speech, the individual with aphasia’s interaction with family members is seriously reduced. On the situation at home, Lubinski (2001) noted that:

The aphasic person’s relationship with the family is altered by the fact that he or she is not able to participate actively in the family, and thus the individual becomes the marginal member of the family. (p. 288)

Literature related to aphasia rehabilitation highlights the important role that the significant others and close friends play in the patient’s life. Lubinski (2001), discussed four reasons why the family is important:

First, aphasic individuals’ initial and continuing impressions of their communication impairment and disability will be grounded in their interactions with the family. ...Second, after hospitalization, most aphasic individuals return to their family living situation. Thus, the primary communication partners and sources of support for outpatient rehabilitation will be the family. ...The third reason why the family is so critical in rehabilitation is that a positive, well-adapting family promotes compliance with therapy objectives. ...Fourth, the family serves as an important source of information to the speech-language pathologist. (p. 286)

Analysis of the problem

While the type of language impairment differs among cases, those affected by aphasia share similar feelings: sadness, anger, loneliness, depression, frustration, social isolation, defencelessness, fear, uncertainty, anxiety, and humiliation.

Returning home is a strong event for people with aphasia; while the shock of the stroke and the problems confronted in hospital come to an end and returning home is experienced as a relief, it is at home where the language and physical impairments become exposed. Parr, Byng and Gilpin (1997) clearly explained that:

Being back at home allows people who have aphasia to realise, perhaps for the first time, the full impact of the communication impairment. While in hospital, they are, to a certain extent, cushioned from the demands of everyday communication: the phone calls which have to be made, the messages to be jotted down, the cheques to be made out. ...Being at home also means that aphasic people have to start using their own time, instead of having it filled for them." (p. 23)

Once at home people with aphasia have hopes about the possibility of returning to the same work and life as before the stroke. For many of them that is impossible. They fear the future, what their life is going to be like, and what they are going to do everyday at home.

When returning to work full time becomes impossible, financial problems often emerge, increasing the feelings of frustration and despair.

Daily life is full of free and unstructured time, but given the impairment, spending time is a difficult task. Parr et al. (1997) indicated:

Chatting to friends, writing letters, reading magazines and books are all activities which depend upon language, and which may have to be modified or forgone. (p. 36)

Aphasia affects the ability to perform roles and interact with others, forcing people to stop joking, arguing, or chatting with a partner, meeting in a bar with friends, or playing with grandchildren. These difficulties in fulfilling roles have negative consequences. Since communicating is frustrating, people with aphasia may not only withdraw from previous social activities and interests, but they may also avoid using language and performing activities where the use of language is necessary. The role changes and the language impairment have negative consequences that affect the whole family. Parr et al. stated that:

Aphasia does not just affect those who have it. The impact of language impairment is felt across entire social networks, by partners, children, parents, siblings, friends and colleagues. As aphasia settles into their lives, they are faced with changes in their relationships with the aphasic person that can be deep and long-lasting. (p. 44)

Family and friends need to adjust to the new situation, look for alternative activities to do at home and provide a supportive context that will increase opportunities for interaction. Simmons-Mackie (2001) suggested that:

Partners need to learn how to create an interaction that feels natural and reinforces the confidence and autonomy of the person with aphasia. (p. 256)

Activities are good at providing spontaneous interaction. As described by Simmons-Mackie, communication takes place in the context of activities; we naturally communicate while having supper, working, gardening, meeting friends for coffee, or playing games (see next page for a discussion of natural conversation). In the area of aphasia, activities of choice should be meaningful to the people affected, should provide a supportive context that will encourage the person with aphasia to participate, and they should be accessible recognising the abilities and disabilities of the person with aphasia. Chapey, Duchan et al. (2001), elaborating on the *Life Participation Approach to Aphasia* stated:

LPAA emphasizes the attainment of re-engagement in life by strengthening daily participation in activities of choice. Residual skill is thus seen as only one of many requisites. For example, full participation is dependent on motivation and a consistent and dependable support system. A highly supportive environment can lessen the consequences of aphasia on one's life, whatever the language impairment. A nonsupportive environment, on the other hand, can substantially increase the chance of aphasia affecting daily routines. (pp. 235-236)

The American Speech-Language Hearing Association (ASHA), in its *Guidelines for Meeting the Communication Needs of Persons with Severe Disabilities* (1991), listed twelve basic communication rights to ensure daily interactions and interventions involving people with severe disabilities, among them:

The right to be offered choices and alternatives. ...The right to environmental contexts, interactions, and opportunities that expect and encourage persons with disabilities to participate as full communicative partners with other people, including peers. (p. 2)

Games to facilitate interaction

AM’s experience in therapy was frustrating, and he rejected every attempt to convince him to engage in further therapy. Therefore, it was pertinent to avoid the traditional therapy model in search for possible activities, and look for one closer to the social conversation. AM’s language impairment makes it difficult for him to interact with his social context. When speaking is not possible, or could be frustrating, what kind of strategies can help provide a structure similar to a natural conversation?

AM played games often with the family before his stroke, and he frequently came home with new games he had bought. The topics and formats of the games were varied, cards, dice, dominoes, “Pictionary,” “Trivial Pursuit,” or “T.E.G.,” an Argentine strategic board game about international relations. He always enjoyed the competitive nature of most games.

Considering that the activity to facilitate interaction between a person with aphasia and the family should be “spontaneous,” the conversation could be considered as a model from which to learn. Simmons-Mackie (2001) compared the structure in the traditional therapy discourse with a social conversation, and found them opposed to each other in the following way:

Natural conversation—the everyday, ordinary talk that serves both social and transactional goals—involves varied discourse structures, creative discourse devices, varying social stances, and shifting social roles. This contrasts markedly with the relatively rigid structure of traditional therapy in which therapist-patient roles tend to be maintained and discourse structures are relatively restricted. ...Restricted discourse structure and passive roles provide little occasion for practising the myriad skills typical of natural conversation. In order for people with aphasia to practice strategies for engaging in conversation then, mediated and supported opportunities should be provided. [p. 254]

She also described the roles in the traditional therapy model as a structure that favours one individual over another, where the therapist requests the patient to perform a task and the patient responds, in a restricted structure that offers few opportunities for participation.

Comparing the purpose, content, context and structure in a natural conversation and in game-playing, we can observe their similarities, as outlined in the following table.

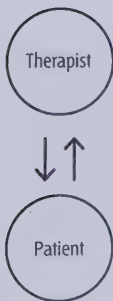


Figure 5.1 Roles in the traditional therapy model. The therapist is in a position of power.

	Natural conversation	Game-playing
PURPOSE	Exchange of information, social interaction.	Mainly social interaction, it could also involve exchange of information.
CONTENT	Meaningful or social topics. The weather is for example, a social topic.	Topics of interest or not. Someone could not like mathematics but play dominoes.
CONTEXT	It occurs in a collaborative, pleasant and social environment.	It occurs in a collaborative, pleasant and social environment.
STRUCTURE	It involves two or more participants, that take turns, make decisions, and collaborate on its development.	It involves two or more players, that take turns, make decisions, and collaborate on its process.

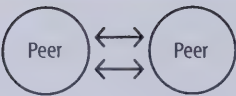


Figure 5.2 Peer roles in the game-playing model.

Playing is an activity with significant social functions, and its structure could be considered close to that of a conversation. Playing occurs in a meaningful environment, it involves equal and shifting social roles, and varied discourse structures, such as performing actions, joking, and gesturing. When playing, first it is your turn, then mine; when conversing first you talk, then I talk. Playing and conversing are constant chains of interactions.

Games are used in education to deliver content in a collaborative environment. The idea of playing has been used in psychology to cope with illness, facilitate family communication, and solve family problems. According to Bromfield (2003):

The goals of psychoanalytic play therapy are many and include helping the child to suffer less (e.g., quelling anxiety and related bodily symptoms, lifting depression, and resolving complicated grief); overcome trauma; adjust to life events, such as divorce; cope with illness and comply with treatment; ...and come to terms with a learning disability or physical handicap. (p. 2)

In aphasia therapy, games allow adult patients to joke and interact with other adults, providing a context in which to express ideas (Boehler, 1984). Griffith (1970), who used games to help stroke patients recover, explained:

The patient is bored, bored to tears, bored to death. ...So you might begin with a few games. Not only will that establish communication between the patient and the teacher, it will also help you find out a good deal about how much the patient can manage. (p. 15)

Game-playing could be an alternative activity to facilitate family interaction, providing a supportive context and a relevant activity. Games could help alleviate the patient's isolation, and encourage a person with aphasia to participate.

A game structure could not only offer possibilities to facilitate family interaction, but also language interaction, through exposure to written and spoken words. Games require the use of several skills: visual discrimination (shape, colour, number), counting, grouping, planning, estimating probabilities and following rules. Some card and domino games include words, short sentences, and require the use of verbal skills. Games involve verbal directions, explanations, answering, asking, or even singing and joking. The situation is repeated over and over, and this facilitates players with language problems or reduced vocabulary to follow a dialogue.

A game could be suitable for persons with aphasia, encouraging them to voluntarily listen, read, write or repeat a word in a supportive environment.

In treatment procedures for reading impairment (*alexia*), reading the same text, oral reading and presenting written words on cards for brief periods have proved beneficial. Beeson and Hillis (2001) explained:

Repeated reading of the same text facilitates a shift from letter-by-letter reading to whole-word reading because of clues provided by sentence context and familiarity with the text. (p. 575)

It appeared that brief exposure presentation coupled with corrected oral reading served to strengthen specific graphemic representations (or access to them). (p. 580)

The idea of using games to facilitate interaction with language and with others was developed partly because it seems that game-playing prompts spontaneous utterances, as stated by Garrett and Beukelman (1992):

There are times when completing a very focused exchange (such as calling out 'I have Bingo,' at a Bingo game...) enables individuals with severe aphasia once again to feel that their social interactions are meaningful. (p. 256)

Games seem to be a suitable tool to increase opportunities for AM's interaction, considering that AM used to play games and still likes to play them. Both the game and the activity could, therefore, create a situation that is supportive and encouraging for AM to interact with his family and to interact with language, through exposure to written and spoken words in the form of brief questions and answers. A system is therefore created comprising: a tool, in this case a

game which facilitates an activity; the activity itself, the playing of the game; and the interaction of the family, which is facilitated by the playing of the game. The tool, the activity and the family interaction create a situation, structuring the environment in a certain way. If the system is altered, interaction might not be facilitated.

The characteristics of the game to be designed should be based on AM's profile, recognising his abilities and disabilities so that he can play with confidence and success. The game should also be motivating for AM and his family; it should provide opportunities for language interaction, through exposure to written and spoken words; and encourage participation.

Defining the role of design in this project

Visual communication design is concerned with the construction of visual messages meant to affect the knowledge, attitudes and behavior of people. A communication comes to exist because someone wants to transform an existing reality into a desired one. The designer is responsible for the development of a communicational strategy, for the construction of visual instruments to implement it, and for contributing to the identification and creation of supporting measures aimed at reinforcing the likelihood of achieving the intended objectives. A careful study of the audience is indispensable, particularly when attempting to generate changes in the audience's attitudes and behavior. (Frascara, 1997, p. 5)

In the design process, there are two recognizable stages: the identification of an area with needs; and the creation of a physical-visual object that serves to achieve the design objective. The idea of using a game to address AM's problems is a design decision based on the analysis of the aphasia problem, the potential of games to facilitate interaction and on the user's profile. The development of the game uses existing design knowledge about visual and physical structures.

In this thesis project, the existing reality is that AM's interaction with others is reduced because of his language impairment. The desired reality is to increase AM's opportunities to interact with others and with language. To do this, the game should be developed considering AM's abilities and disabilities so that he can succeed, and considering AM's interests so that he is motivated to play. In design, this approach is called user-centred design, in other words, a design process that pays fundamental attention to the needs, wants and

possibilities of the user. (For more specific information about user-centred design see page 26). However, the approach is not only used in design; in aphasia therapy, there is a new tendency to develop treatments specifically for a patient. Bandur and Shewan (2001) stated that:

LOT [Language-Oriented Treatment] is designed to provide a highly individualized and tailored approach to treatment based on the language profile and the interests and goals of the patient. (630)

If the communicational strategy were to be developed for a different user, within a different context, let us say a lady with aphasia who likes gardening and does not have family or friends, the design response would be different.

The methods and the design process of this project are not specific to the domain of the design discipline. As Frascara stated above, designers deal with knowledge and behaviours. In this project, the designer is seen as a coordinator of knowledge, design knowledge, aphasia knowledge, educational knowledge, psychological knowledge, to understand 'the reality;' why it exists and how it could be transformed for the better. Using appropriate design methods and processes, the designer links knowledge of aphasia, of the potential of games and of the intended user to create possibilities that will transform the reality identified, in an attempt to improve AM's quality of life.

Design process and research process

The design and the research processes are intertwined and cannot be separated.

The design process begins with the identification of an area with needs. Without this first step there is no possibility for meaningful design. Identifying needs means recognising that something is not working, or that it could work better. It also means identifying the lack of knowledge one has to deal with in order to understand the problem.

Research can help find the information necessary to understand the problem at hand, but which research methods should be used? And, what is it that one needs to know? The main goal of research is to develop knowledge; research involves learning. The research process is full of questions and uncertainties. The design process is full of action, of making, of trying, of thinking, and also of learning. Both processes require decisions; these can be right or wrong, and only at certain points of the process, and at the end, will one be able to evaluate the design decisions made.

The realisation of the design idea implies applying design-specific knowledge, knowledge acquired in school, through the practice of design, or even through teaching. But this knowledge, when dealing with people with special needs, could be insufficient, requiring further research.

The research question in this project helped identify what the researcher needed to know in order to design the game. For example, how the game could be adaptable, how the elements of the game could be easy to handle, and how the text could be comfortably readable.

Examining the research based on the literature review, and employing the user-centred approach used in this project helped provide possible answers to the design questions stated previously. In order to design a comfortably readable text it was necessary to learn what happens with reading for people with Broca's aphasia; to understand how reading could be facilitated through the appropriate application of typographic knowledge; and what kind of response should be developed when reading is not possible.

Although based on research, the understanding of the problem – and consequently the design decisions – could be wrong. To avoid this, evaluation methods are necessary to review the decisions taken and to determine if the design idea was appropriate. In this project, experts in aphasia and in design were interviewed regarding their opinions about and assessments of the design decisions applied to the game prototypes. As well, to reduce uncertainties, a conversation was held with the intended user.

The last step in the intertwined design and research processes was to analyse the data collected in order to develop guidelines and recommendations. This is a process of segregating and integrating information. This is not the last step of these processes; when arriving at conclusions and limitations, and identifying new questions, the need for more research often emerges.

6 | Research question

In this section

Main question

Subquestions

Research methods

Heuristic evaluation

Expert interviews

Literature review

Research approach

User centred-graphic design

In this section the research question and its related subquestions are presented, briefly mentioning the possible design responses. Research methods are discussed. Assumptions and uncertainties are stated. The need for a customized solution is outlined.

As discussed earlier, people with Broca's aphasia can have their speech reduced to a few words. To communicate with others speaking, writing or gesturing, can be very hard and frustrating. The impairment could be accompanied by paralysis or weakness of the right side of their body. In many cases their professional life is over, they are no longer able to perform the activities that they used to, and their roles in the family (and society) have changed. Given the lack of language abilities, they feel isolated and depressed. Families play an important role in the individuals' re-engagement in family interaction.

Main question

How could visual communication design guidelines be developed for the design of a game to increase opportunities for people with Broca's aphasia to interact with their families, and with language, through exposure to written and spoken words?

Subquestions

1. How could visual communication design guidelines be developed for the design of this game?

Guidelines are a set of principles, references and steps to follow. The development of guidelines for the design of games for people with Broca's aphasia, will be based on the identification of the disciplines related to the design of this game. Heuristic evaluation, expert interviews and literature review will be the methods used to access relevant information.

2. How could a game increase opportunities for people with Broca's aphasia to interact with their families, and with language?

Games allow people to work in teams; this creates opportunities for people with Broca's aphasia to become involved in social interaction, to joke with others, and to enjoy company again. Playing has been used in group therapy to help individuals cope with illness and to adapt to life events. Language can be used through the exposure of written and spoken words in the form of brief questions and answers, and by adopting a language rehabilitation treatment whose appropriateness has been proven by speech therapy, and by showing prototypes to experts in speech therapy for their evaluation and response.

3. How could this game be adapted to different individuals with Broca's aphasia?

The differences between cases makes it necessary to customize the design of the game to specific needs, skills, and interests of every individual. Hence this project uses a user-centred design approach and is specifically tailored to the intended user.

4. How is this game adapted to individuals who do not like to play games or to interact with others?

This game is not adapted to those individuals.

5. How could a game be designed so that it is usable by people with Broca's aphasia?

The elements of the game should be designed considering the users' impairments. The elements should be easy to handle, and the text (typography) should be comfortably readable by the users.

6. How could this game be appealing to the users?

The game will be made appealing through following the aesthetics of the games for adults, without distracting or compromising legibility. Their topics will be customized to respond to areas of interest of the users.

7. How will the effectiveness of the final testing prototype be assured?

Responses by the experts will be used to modify the design of the prototypes, and they will also be shown to the intended user for evaluation.

Design Product	Users	Goals
A board game; designed according to specific needs, skills, and interests of the user	People with Broca's aphasia, their families and others	To develop guidelines, to design games to create additional opportunities for people with Broca's aphasia to interact with the family and with language
Approach	Methods	Collecting Data
User-centred design	Heuristic evaluation Expert interviews Literature review	From expert interviews, literature review and a conversation with the intended user.

Research methods

Heuristic evaluation

This is a method originating in engineering, aimed at finding usability problems, for example in an interface design. The term heuristics, refers to “a rule or solution adopted” (Audi, 1999). According to Nielsen (1994), different people find different problems. The evaluators can be domain experts, who will inspect the interface and verbalise their comments, or present a written report.

In this project, experts in aphasia and in design evaluated the game prototype so that errors or other problems could be spotted before the project would be presented to individuals with aphasia. The evaluation session was developed during interviews. The experts comments were verbalised while the researcher and an assistant took notes. The meeting with each expert lasted between one and two hours. To guide the interview a questionnaire was developed based on the list of topics shown below. These topics emerged from assumptions and uncertainties the researcher developed.

LIST OF INTERVIEW TOPICS

Game playing as an activity to facilitate family interaction
Appropriateness of the activity to share with the family
Benefits of the activity
Length of the activity
Customizing a tool for a specific individual / Benefits
Use of family names
Complexity and length of the text
Size of the cards
Size of the board / Use of racks
Design layout
Use of articles and prepositions
Word separation
Colour palette
Colour to facilitate matching
Colour preferences (soft or bright)
Use of patterns
Patterns to facilitate matching
Usefulness of patterns
Facilitating reading

There are different kinds of interviews that serve different purposes as tools to collect information. This project in particular used “experts interviews.”

Expert interviews

Neuman (2003) reported two different kinds of interviews, “survey interview” and “field interview.” The first one is a structured conversation with prearranged questions; in contrast, the second one is closer to a friendly conversation. McTavish and Loether (2002) proposed a “personal interview,” as a meeting in which the interviewer has developed an interview schedule or list of questions. The advantage of this kind of interview is that “the interviewer can clarify questions that the respondent does not readily understand and can observe the respondent during the interview” (p. 157). Jones (1980) indicated that interviewing users is a method to elicit information, and that “it is useful to have a list of proposed questions to remind the interviewer of major design doubts” (p. 216).

As a designer not specialized in the terrain of aphasia, the researcher needed expert opinions to evaluate assumptions and uncertainties.

Assumptions:

- Game playing could be an activity to facilitate family interaction.
- Customization is essential in the area of aphasia.
- Family names and topics of interests are useful to increase motivation.
- The appropriate use of typography could facilitate word recognition.

Uncertainties:

- The use of colour could facilitate matching question cards and answer cards.
- The pattern could facilitate matching question cards and answer cards.
- The white frame could help the player separate the card from the background.
- Century Schoolbook could be appropriate.
- Increasing the size of the key sentence and highlighting its area is appropriate.
- Increasing the size of punctuation marks is an advantage.
- Increasing the spaces between words could facilitate reading.
- Increasing the spaces between words and punctuation marks facilitates reading.

In this project “expert interviews” is understood as a method to consult about game prototypes, with experts in aphasia and in design. The purpose of the interviews was to confirm assumptions and reduce uncertainties.

Literature review

This research method is in general conducted to find out what has been done in an area, or to locate information about a topic of interest. Beins (2004) suggested that to start the search one has to select a “relevant term” and look for it in an electronic database (p. 71); In contrast, Cross and Roy (1975) suggested that to start one has to identify the questions to be answered, in order to develop the project with some level of confidence; and use “experts opinions (review articles, experts, etc.)... to identify the most promising sources.” (p. 37)

To understand and learn about aphasia, the researcher was given a reading package by one expert in the area, who also recommended books and articles to read (see references and bibliography). The reading package was not only efficient for the understanding of the area, but also for identifying other sources mentioned in the reference lists or in the bibliography of the articles enclosed. This search strategy of using reference lists of journal articles is called according to Schlosser (2003), “ancestor search.”

To find information for the development of the prototype, a literature review was conducted related to aphasia, design and games. More specifically, the search encompassed the following areas:

Aphasia in relation to treatments, group treatments, social interaction group treatments, family activities, home therapy and more specific aspects related to the disorder, like Broca’s aphasia, reading impairments, and neuropsychiatry;

Visual communication design in relation to Gestalt theory, and mainly typography: reading, designing for the visually impaired, legibility, readability and comprehension, typeface and leading preferences, and reading instructions;

Educational psychology in relation to games, the design of games, the use of games in the classroom, family play therapy, and play therapy; and

Game theory, in relation to general aspects of games, conflict resolution, and philosophical aspects.

A literature review was also conducted to learn about research methods in the areas of design and the social sciences. Finally, to find solid arguments about the social importance of language in our culture, a search was briefly conducted in the area of anthropological linguistics.

Handsearch strategy (Schlosser, 2003) was adopted when searching information related to typography and the use of games in educational

psychology. In typography, *The Journal of Typographic Research*, (currently named *Visible Language*) was the main source. The researcher reviewed the table of contents of volumes from 1967 to 1990. The key word used was "reading," reading disabilities, reading process, silent reading, reading performance, and topics like word recognition, handwriting, spelling, listening, etc. Once titles were identified, the abstract of each article was read to check for relevance. If the article was considered appropriate, it was selected for reading.

7 | Designing the response

In this section

Design questions

Design of the prototypes

How to make the content...?

How to make the game...?

How to make the elements...?

How to make the text...?

How to make the game appealing...?

How to customize the topics?

Design of the instructions

Playing the game

To start playing

Principles for the design of the game prototypes are discussed with particular reference to the intended user, including conceptual, visual, typographic and physical details. The design approach is discussed, the importance of adapting the design of the game to the user is stressed, as well as considering the situation of use. The section closes with an explanation of how to play the game.

Design questions

Once the research question and subquestions were formulated (see Research question on page 20), key elements were extracted and transformed into statements to guide the development of the design response. They were:

- the content should be appropriate and relevant to the user;
- the game should be adaptable to the needs, skills, and interests of the individual;
- the elements of the game should be easy to handle;
- the text should be comfortably readable;
- the game should be appealing to adults; and
- the topics should be customized for the user.

The statements above helped formulate design questions. The general design questions were how the game might work, and how the game might look. All the questions below were conceived to generate responses related to the intended user.

- How to make the content appropriate and relevant?
- How to make the game adaptable to the needs, skills, and interests of the user?
- How to make the elements of the game easy to handle?
- How to make the text comfortably readable?
- How to make the game appealing to adults?
- How to customize the topics?

Design approach

User-centred design

The researcher understands *approach* as a way of developing the design process. In the social sciences, it is also called *methodology*. Beins (2004) refers to it as the techniques and approach used to study a problem.

Sanders (2002) considered this approach as one where the researcher collects data to know about the needs of the user, and the information is then transformed into design criteria that will be used by the designer to produce a product, communication or space. In this approach, the user does not really

work with the designer and the researcher as part of the team, “but is spoken for by the researcher” (p. 1). Jordan (2002) proposed a person-centred design approach, where not only the age, sex and profession, but also feelings, ideals and personalities of the user are considered in the design process. Wilson (2002) defined human-centred design as an approach where to understand the needs of the users it is necessary also to know “the situations where they live, work and play” (p. 28). Frascara (2001) defined user-centred design as a process that not only pays attention to the abilities and wants of the user, but also includes “the users’ physical and psychological health and well being” making the approach “culture and knowledge dependent” (p. 1312). In other words, one should be aware of the cultural context and value systems of the individual with aphasia, and the elements that are used in the game should relate to those values and to personal interests and abilities.

User-centred design is understood in this project as an approach where the aim is to benefit the users, by paying fundamental attention to their needs, abilities, possibilities, wants, physical and psychological health and well being. It also pays attention to the situation or context in which the product will be used. In many projects the use of this approach could be beneficial, but when working with specific needs, and with a disorder like aphasia that varies from case to case, to use this kind of approach is indispensable.

Sanders (2002) proposed moving from user-centred to participatory design approaches, including the user in the process. In participatory design, the user and the designer work together in the development of the response. This approach is suitable for aphasia cases, but given that AM lives in Argentina and the researcher is in Canada, it was not possible to use a strictly participatory design approach in this project. AM did act as a consultant and participant, providing a frame for the design response.

Design of the prototypes

Prototyping allows for the assessment of size, format, colour, typeface selection, and other design decisions applied to the response before the final design; and to observe what works, in the playing situation.

One of the aims of the literature review was to understand the special needs surrounding the design of a game for people with Broca’s aphasia.

Based on the literature review, on the knowledge about the user, and on the designer’s knowledge, two prototypes were created (named after the fonts

used in their design). The first one called *Goudy*, was later modified creating a second option called *Century*. Both prototypes, *Goudy* and *Century* were shown to the experts in design and in aphasia for advice regarding assumptions and uncertainties about design decisions.

How to make the content appropriate and relevant?

As a designer without expertise in aphasia therapy, the researcher could not create a content or text that would suit the project requirements. The ideal situation would be to work with specialists in the area.

Klare (1984) mentioned that when selecting the content material, it is fundamental to consider:

- The reader's knowledge;
- the reader's interests;
- the reader's intellectual level; and
- the reader's maturity

A literature review provided a possibility for the content of the game. A treatment developed by Helm-Estabrooks and Nicholas was identified as a possibility for the content. *Sentence Production Program for Aphasia (SPPA)* has eight different types of sentences, and two levels of difficulty. The aim of the treatment is to improve sentence production in individuals with nonfluent aphasia (Broca), with an emphasis on functional communications (Helm-Estabrooks and Albert, 2004).

The designer saw a possibility to adapt the treatment to a questions and answers game format, to facilitate the user interaction with language, through exposure to written and spoken words.

One kind of sentence, *wh*- interrogative sentences (what, who, where and when), at one level of difficulty (level A), was selected to develop the prototype. The goal of the treatment program at the first level is to repeat the key sentence in response to a question.

Helm-Estabrooks and Albert (2004), proposed as an example:

"Paul sees that his wife has turned what and who on the TV, so he asks,
'What are you doing?' What does he ask?" (p. 241)

In the *Goudy* prototype, the sentences were very close, some times identical, to the samples proposed by Helm-Estabrooks and Nicholas. For example: "Carolina called Mario to announce that this afternoon she is coming with the children. Mario asks, 'When are you coming?' What does he ask?"

Instead, for the *Century* prototype, the texts were shortened; for example: "Guille asks Mario, 'When are you coming?' What does she ask?"

SPPA has three families as characters; the three families belong to three different social groups changing ethnically and in terms of age.

As part of the process of customization and to increase the user's motivation to play, the characters were named after some of his family members. In the *Goudy* prototype several family members appeared, in the *Century* prototype only some of the closest family members appeared.

Figure 7.1 Family members network used for the 'Century' prototype.



How to make the game adaptable to the needs, skills, and interests of the user?

By knowing the user and conversing with him, the researcher was able to list what he can or cannot do, what he wants, what he needs, which are his topics of interest, and which activities he prefers. Nine activities were written on pieces of paper, and given to the user for him to rank them according to his priorities.

WHAT THE USER CANNOT DO?

- He cannot construct a sentence
- He cannot write
- He cannot use comfortably his right hand

WHAT THE USER CAN DO?

- He can pronounce some words like 'yes,' 'no,' 'Oh! well,' 'Good!' and nouns
- He can grab some things with the right hand and use his left hand
- He can play dominoes, with numbers and images
- He can read the menu in a restaurant, titles and subtitles in the newspaper

WHAT DOES HE WANT AND NEED?

- He wants to be able to construct a sentence
- He wants to have a conversation
- He needs a structure that will help him to interact socially

TOPICS OF INTERESTS IN A CONVERSATION

- The family
- Soccer
- Music (classical or jazz)
- History (Argentine or International)
- Wine
- Tourism
- Humour and joking

PREFERRED ACTIVITIES (RANKED)

- Go for a coffee
- Listen to music
- Play with the oldest grandchild, Agustina
- Go for a walk
- Greet people on the street
- Watch a movie
- Talk on the phone
- Watch TV
- Read the newspaper

How to make the elements of the game easy to handle?

It is advisable to adapt the size of the elements to the impairments, sizes of human bodies, context of use and task requirements.

To adapt the treatment, the game needs to have question cards and answer cards. The cards should have enough space for short sentences, while being

close in size to the standard playing cards. If the cards were too big, the game will not look appropriate for adults, and the board will cause problems when using it on tables. Given that the cards will have short sentences, they should be used horizontally to avoid having one or two words per line. A white frame in the front and back of the cards, helps discriminate the cards from their background, and reinforces the colour area of the text.

A board would help provide a structure to follow the different steps of the game, and will help the game look like a game. The size of the board should be considered in relation to common table sizes, and to the movements required for handling the cards and the tokens. The thickness of the boards changes depending on the game.

A rack would facilitate holding the cards for the player with aphasia, avoiding the use of the right hand, while helping him see and read several cards at the same time. The racks will prevent the other player from seeing the cards.

A pair of tokens will show who is winning, avoiding confusion and note taking; given that the person with aphasia has problems with the right hand, the token will be on the left of the player. The size should be in relation to the human hand. For the prototypes, "square tiles" from a standard crossword game were used. Their size is 1.9 x 1.9 cm, by 0.9 mm.

How to make the text comfortably readable?

To arrive to typographic decisions it is vital to understand reading as a cognitive process. Plaut (2005) defined reading as:

A highly complex task involving the rapid coordination of visual, phonological, semantic, and linguistic processes. (p. 24)

For a text to be comfortably readable, it has to be legible. 'Legibility' is a term frequently used in typography; definitions vary according to different authors. Reynolds (1984) explained that:

The term "legibility" ...has been applied to studies ranging from the visibility and perceptibility of individual characters and words to the comprehensibility of continuous text. (p. 193)

As it has been explained, 'legibility' refers to the ability of the reader to recognise the shape of letters and words. The first step in the reading process is the visual identification of the word, so when designing text, it is important to consider some factors that are going to affect the text legibility, such as the

type style and proportions; size; spaces between letters, words and lines; line length; and layout. The reader's preferences is another aspect to consider, since these are likely to affect reading performance (Prince, 1967).

Tinker concluded... that readers prefer those choices or typographic arrangements which they can read most easily. (Reynolds, 1984, p. 195)

The first step in designing the text was to determine what the user could read. AM could read the titles and subtitles in *La Nación*, a national Argentine newspaper. The typeface used in the newspaper is Bodoni LN, specially designed by Matthew Carter. The height of the lower case in the subtitles is about 3 mm, therefore this was considered a reference for deciding type styles and sizes.

The second step was to consider AM's type style preferences, assessing his age, profession, and topics of interest when reading; it was assumed that he was used to reading, and consequently preferred, text set in serif typefaces. Reynolds (1984), on reader's preferences stated:

Readers of serious publications do have preferences with respect to typeface. [Burt] found that some readers had a tendency to prefer old faces while others modern faces. (p. 198)

Ice laundry 1

Ice laundry 1

Figure 7.2 Above, a sans serif type with similar characters. Below, a serif type with distinctive characters.

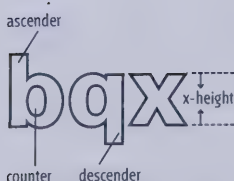


Figure 7.3 Terms used in describing features of type.

On another project for the same user, the researcher selected a sans serif typeface, later realising that the choice was a mistake. The capital "I" as in *Ice*, the lower case "l" as in *laundry*, and the number "1" were the same, a single vertical line (first identified in Noël, 2006). When working with stroke patients, it is important to have a typeface with good differentiation between letters. The typeface selected should have distinctive characters; serif typefaces have, in general, more distinctive characters than sans serif fonts.

TYPEFACE SELECTION

As it was previously mentioned, typeface style affects the legibility of the text. Given this, and considering the information above, several serif typefaces were analysed, considering distinction between characters, length of ascenders and descenders, shape, and counters.

Ascenders and descenders help people recognise the word profile. On the subject, Prince (1967) explained:

Each word forms a picture which, in older people at least, has been imprinted on the mind in conventional types over long period of time. (p. 37)

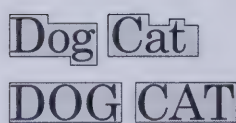


Figure 7.4 Example of word profiles in words set in upper and lower case (above), and the elimination of the word profile when set all in capitals.

Comprehension

Comprehension

Figure 7.5 Above, a word set in a typeface with short ascenders and descenders affecting word recognition. Below, a word set in a typeface with more legible ascenders and descenders.

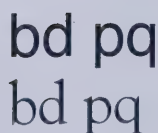


Figure 7.6 Above, a typeface with similar "b," "d," "p," and "q" forms. Below, Goudy showing the more distinct, "b," "d," "p," and "q" letters.

Reading comprehension depends partly on our ability to identify printed words, since it demands the perception of graphic symbols (Reynolds, 1984). We seem to have in our brain a kind of store with a set of familiar word pictures. According to Lupker (2005):

Lexical memory, or the 'lexicon,' is a mental dictionary containing entries for all the words a reader knows. (p. 39)

Under normal circumstances, when we recognise a printed word we access its meaning. If the ascenders and descenders are short, word recognition is more difficult. If the word is printed in capitals, the word profile is eliminated and reading is more difficult (Spencer, 1968; Reynolds, 1984; Hartley, 2004). Following this idea, it is important to use upper and lower case, and to select a typeface with visible ascenders and descenders to facilitate word recognition, and activation of meaning. Walker and Reynolds (2002/2003) noted that:

Our criteria for typeface choice were determined first by general characteristics held to be important in choosing typefaces that are suitable for children: relatively long ascenders to help emphasise the word shape; clear distinction between characters so that similar ones (such as o's and a's in some typefaces) are not confused, and lack of unusual or quirky letters. (pp. 112-113)

Following Walker and Reynolds' criteria, two typefaces were selected: Goudy Old Style and Century Schoolbook.

The typeface Goudy Old Style, more used as display than as text typeface, has very good ascenders that facilitate word recognition, but also very short descenders that could cause difficulties (see figure 7.5 for how ascenders and descenders affect word profile). There are different lengths for the "f" and for the "t," facilitating the distinction between the two letters. It has very round characters, with wide apertures, that facilitate the recognition of the letters for readers with poor vision. This typeface has distinctive characters; it has formally distinct shapes for "b" and "d," and "p" and "q," and it is well known for its "g" with an upward pointing ear.

Century Schoolbook is recommended by the Americans with Disabilities Act (www.ga.wa.gov/ada/lgprint.htm) and it is widely used in books, magazines and newspapers. It has long ascenders, and short descenders. The ascenders have a uniform height, and the serifs in the ascenders are slightly angled accentuating the ends and consequently making the letters distinctive. One

of its attributes is that, at a medium weight, it offers a good tone and this could facilitate word perception. However, letters such as 'a' and 'e' show small apertures; if the apertures are small, the letter is less legible and could be confused for example with an 'o.' Century has letters with distinguishing characteristics, such as "b" and "d," and "p" and "q."

SIZE

The 3mm of x-height – height of a lowercase without ascender or descender (see figure 5) – used in the subtitles of the newspaper that the user reads, was the size chosen to set the smallest text in the cards. The key sentence was set in a 3.9 mm x-height.

WORD SPACE

Reading comprehension is affected to some degree in most individuals with aphasia. The impairment will differ among cases, but some patterns can be recognised. It could be that:

- the vocabulary of written words has been eroded,
- to recognise a word it is necessary to spell it letter-by-letter,
- in order to recognise a letter it has to be traced on the patient's hand,
- patients have problems activating meaning and sounding out words, or
- oral reading is affected.

In these cases the length and the frequency of use of the word should be controlled; long words and low frequency words can be a problem. Short words and high frequency words are read better. In cases with an impairment of semantics, words that are semantically related (cat-dog), that look visually similar (same-some), verbs (walk-walked) or prepositions (under-until) can be confused. For more information on the subject, see Beeson and Hillis (2001).

Considering the patterns of reading impairments in people with aphasia, the *Century* prototype has increased spaces between words to facilitate word recognition. The space between words is constant, to favour legibility (Wiggins, 1967).

Mario is in the square.

Mario is in the square.

Figure 7.7 Above, text with 'normal' word spacing. Below, text set with wider spaces, and increased punctuation marks.

Walker (2005) found in her study with children that wider word spacing was helpful for some children; it facilitated word spelling. Bever, Jandreau et al (1990) demonstrated that poor readers do better when increasing spaces between words to isolate major sentences. Word spacing should clearly separate the words without disrupting reading (Reynolds, 1984).

PUNCTUATION MARKS

It is possible that adults with aphasia have visual impairments, as many other adults do, but they are not able to verbally express the impairment.

Prince (1967) advised enlarging the size of punctuation, since it is a subject frequently commented upon in reading tests by people with and without visual impairments. He suggested that the period should be 30 per cent of the height of the lower case "o." To avoid the period being darker than the word, in the *Century* prototype the height was increased to 25% and some little extra white space (a hair space) was added between the word and the marks.

LAYOUT

Written language is parallel to speech. Its visual appearance, the layout, should have a clear and accessible structure, helping direct the reader through the text. Waller (1987) called the use of layout to shape arguments "text-as-diagram." In a diagram, conceptual relationships are represented by perceptual principles such as proximity, similarity and closure (Gestalt psychology).

To make the text accessible, it is broken into short units of meaning (i.e. subject + verb in the first line). The two first lines of text provide context, and are set on regular typeface at a medium weight (see appendix E).

The main voice is for the key sentence (the one that is the answer), therefore a larger size was used that also results in a darker tone, to map out its structure and help identify its function. The darker tone also helps create a visual rhythm, making the visual appearance of the text 'playful.' The layout also enhances the key sentence by using, in the *Century* prototype, a lighter colour band for its background.

The last sentence is like an off-stage voice, i.e. "what does she ask?" so it should be emphasized differently. In the *Goudy* prototype, it was set in italics. However, Hartley (2004) mentioned that given that the proportions of the italic letters are compressed, they are harder to read. In their guidelines for visually impaired people Text Matters (2001), an information design consultancy, advised against using italic type for continuous text.

The reader's performance depends not only on typographic decisions, but also on several other factors like the reader's knowledge, the reading situation, and the reader's motivation (Klare, 1984). Klare advised against including new words that the reader does not already have, since it could negatively affect the reader's performance. The reading situation, in this particular case is not a test, which is stressful per se, but rather a playing situation that is relaxing. This could foster the reader's motivation, consequently benefiting the reader's performance.

THE PATTERN

Research **subquestion 3** is concerned with how to make the game adaptable to different individuals with aphasia. Considering that some individuals with aphasia could have severe reading impairments, a set of patterns was developed to facilitate playing the game by matching patterns, rather than by reading alone. Reading impairments do not necessarily affect pattern perception. According to Julesz (1971), pattern perception is considered spontaneous and requires no learning. He stated:

These central processes that are required for extracting the global information (such as the orientation of a line segment) should not be confused with the even higher processes required to recognise letters. (p. 19)

The patterns are located in the bottom right corner of the cards; in the Western reading sequence, one begins at the top left and ends at the bottom right. In this way the game invites the users to first look at language (the text) and then attend to the pattern as a final step. The orientation of the patterns is horizontal, they vary in darkness (see appendix E for differences between the *Goudy* and *Century* prototypes). Regarding pattern matching, Julesz (1971) explained:

A simple level of pattern matching occurs when two patterns are physically presented side-by-side to subjects who are asked to compare them. Such a process operates in visual texture discrimination, where the basis of comparison is not point-by-point but rather, some extracted features are matched. ...In contrast to shape recognition, no memory is required. (p. 55)

Therefore, it can be said that pattern matching is simpler and more accessible than reading, and could help build the confidence of people with aphasia when playing the first level of the game.

How to make the game appealing to adults?

If the design of a game is appealing, the user will have a stronger inclination to play, will perform better, and will show less fatigue (Becker, Heinrich, et al. 1970).

When analysing the aesthetics of board games for adults, we can see that there is a wide spectrum, normally:

- **the colours** are in a controlled range and quantity. They can be mainly white, with accents in one or two colours; or mainly dark, with white accents;
- **the typeface** can be serif or sans-serif, the same or different sizes, all caps or upper and lower case, colour or black and white; but always legible and not excessively playful;
- **the board** can be cardboard or paper, in one or more pieces, folded or not;
- **the cards** can be a thick or thin rectangle, a square, or even a circle;
- **the token** can be plastic or wood, colourful or natural wood, big or small; and
- **the content** could be science, architecture, math, or other adult subjects.

An example of games for adults, is the *New York Architectural Game*.

Board games for adults will normally not include:

- **cartoonish drawings** of animals or people.
- **colours** in a wide range of hues and saturations.
- **typefaces** that are not designed for text, with one colour per letter, in different variable combinations (italics, bigger size for the capital, baseline alteration, curved path), or with colourful outlines.
- **board and cards** visually overstimulating.
- **content** about police patrol, fire-fighters, builders, growing a garden, doll houses, orient expedition and dragons.

For information about aesthetics of games for children, please compare *Scrabble* and *Scrabble Junior*.

The aspects that would make the designed game look like a game, and appealing to adults are:

- the elements;
- the layout;
- the content; and
- the colours.

The elements, the layout and the content, have already been discussed. Two colour palettes were developed to make the game appealing. Considering that colour should always allow the use of text in black or black-like colour to favour legibility, their intensity differs. In the *Goudy* prototype the colours in the cards are mainly bright; in the *Century* prototype the colours in the cards are lighter in tone, which favours the legibility of black lettering. The dominant colour in the board and on the back of the cards is olive green. The tokens and the racks in *Century* are pine wood colour.

Since the user and his family do not suffer from colour blindness, colour was used in the game to facilitate matching question cards and answer cards.

How to customize the topics?

Many factors should be considered to ensure the success of the activity; one of them is motivation. If the topics or the activities are not motivating, interaction will not be achieved.

It is fundamental to develop activities and topics that will motivate and facilitate the user's participation.

Clinicians in the area of aphasia are aware of the importance of motivation, and treatments now are starting to be individualised and tailored based on the interests and patterns of impairments of the patient. Bandur and Shewan (2001) on the subject described:

Individuals with aphasia have demonstrated superior performance on language tasks, ...when personally relevant material is used (p. 636)

To make the game motivating to use it, it has two main aspects: the names of the closest family members, and humour.

Family names carry positive emotional connotations, depending on the relationship of the members. Helm-Estabrooks and Albert (1991) stated:

The emotional value of a word may influence performance, so that words such as love may be easy to repeat. (p. 40)

In the text, family members perform unexpected tasks, make unexpected comments, or ask unexpected questions that results in funny situations. For example, it is well known in the family that Jorge does not watch soccer, so he will never ask Mario: *When is the game?* This unexpected question from Jorge, can make the family laugh.

These unexpected tasks, comments, or questions have to be customized according to each family. Humour changes depending on the individual and the culture. There are cultures where people play more than in others, for example since in Holland people like playing games, the Dutch Aphasia Association has created three games for people with aphasia: *Afiant*, *Kwartet*, and *Memory*. What is funny for a family may not be funny for others, the same happens with culture. There are funny topics and jokes that are culturally framed.

Humour has to be used properly, without embarrassing the family members, and being sure that the joke will be funny to everyone. Simmons-Mackie (2004) stressed the importance of humour in therapy, and the important role that it has in "human communicative interactions." In her article *Just kidding!...*, Simmons-Mackie, mentioned that humour: motivates, decreases depression, helps recovery, and is an intensive social and communicative form.

Design of the instructions

As part of the design of the prototype, booklets with instructions and rules were designed. The first step for the design was to understand the concept behind the games. The instructions should explain what the game is about, and how many people could play. They should guide the user, teach and show how to use the game; what actions to do, when to do them, how to do them, and what should happen as a consequence (Mijksenaar and Westendorp, 1999). The instructions should show the elements of the game, where to place them, and how the set up should look.

The instructions should explain and show all the steps to follow, in a clear sequence; what to do first, what would be the effect, and what could happen, if for example, the player does not have the right answer; and most importantly, how to win.

GLOSSARY OF TYPOGRAPHIC TERMS

Ascender: part of the lower case letters that rises above the height of the x-height, such as in "b," "d," "f," "h," "k," "l."

Counter: enclosed space inside some letters, as in "d," "o," "p."

Descender: part of the lower case letters that extends below the base line, such as in "g," "j," "p," "q," "y."

Hair space: the narrowest space used in typography.

Sans Serif: a typographic style that lacks serifs in the top and bottom of a letter.

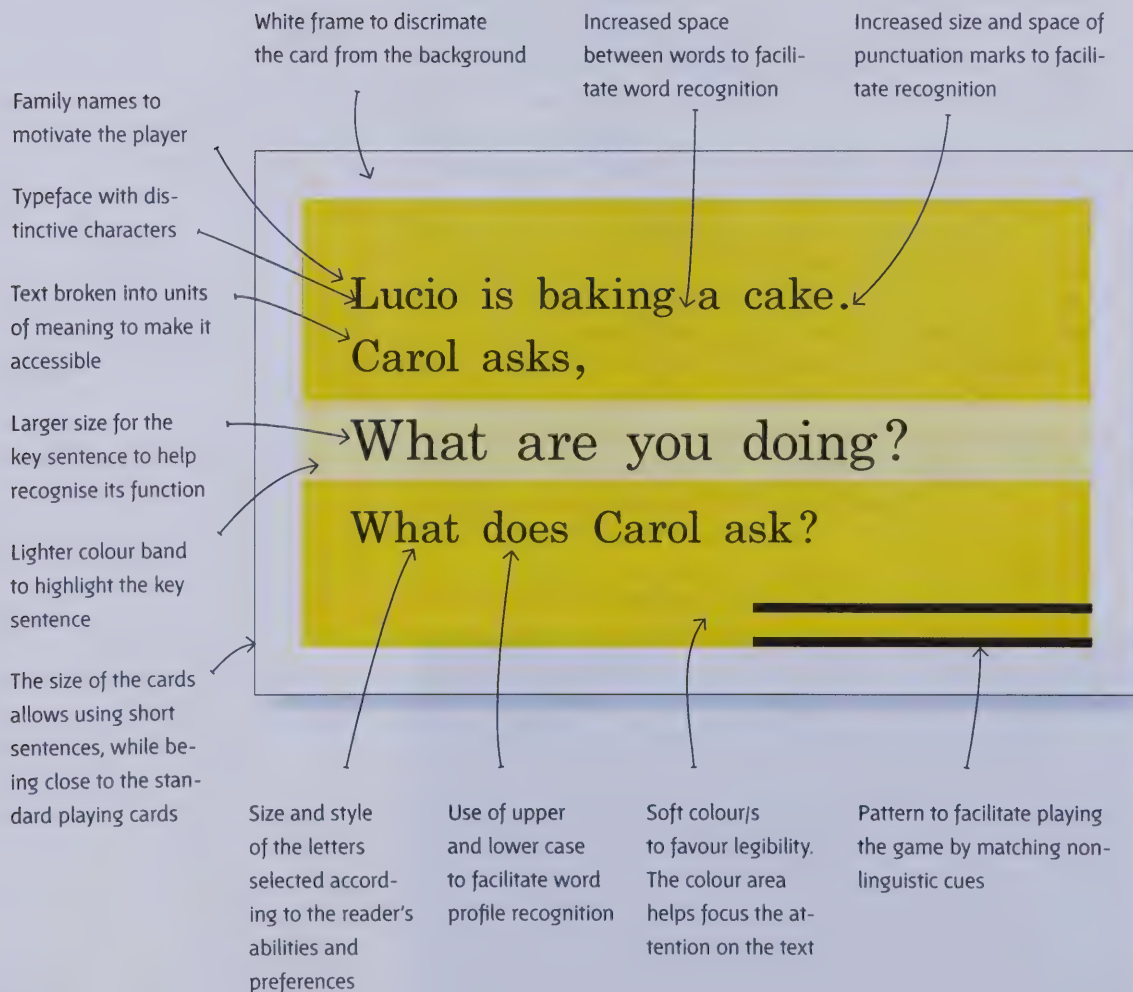
Serif: end or stroke at the top and bottom of a letter.

Stroke: principal element of a letter, such as the vertical line in an "R."

Typeface: system of letters in upper and lower case, numerals, accents, and related symbols like parenthesis, in all proportions (condensed, narrow) and weights (light, regular or medium, semibold, bold, black), and styles (roman, italics) that share same features.

x-height: height of a lowercase without ascender or descender, such as "x."

In the card below (Century prototype, real size – 13 x 8 cm), some of the design decisions are summarised.



Playing the game

Questions & Answers is a customized board game, designed for AM, a person with Broca's aphasia. The game provides AM with opportunities for him to interact with the family, with others and with language, through exposure to written and spoken words; in an encouraging and supportive environment.

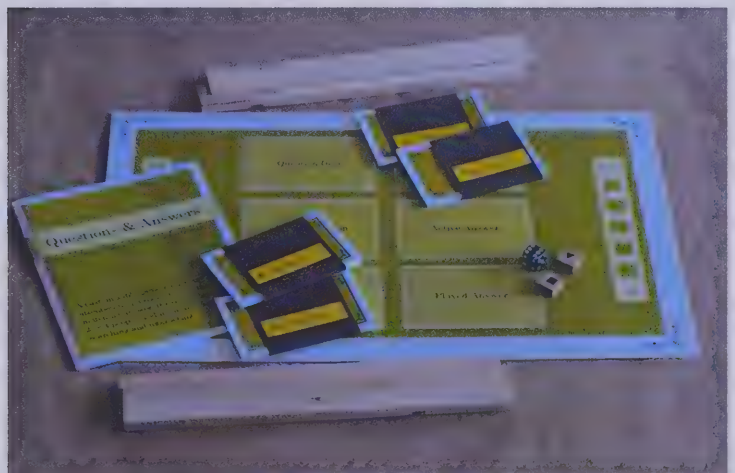
The main activity of the game is to pay attention to questions, and to find the right answer. It can be played by 2 or 4 players, and it involves looking, searching, and interacting.

Questions & Answers has a board, 4 racks, 2 tokens, a die and 2 sets of cards, one for the first level of difficulty, and the other for the second level of difficulty. Each set has 12 Question cards and 12 Answer cards.

The board provides a structure that facilitates following the sequence of steps. It must always face the person with aphasia. The cards provide support for the linguistic content of the game. The racks allow players like AM with the right arm weak or paralysed, to play without using it, and provides a comfortable reading angle.

The first level is aimed at gaining confidence, and its main task is matching question cards and answer cards. The second level is aimed at interacting with words; the main task is reading to find the right answer.

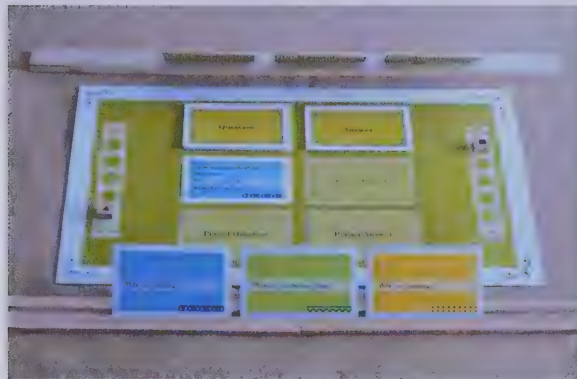
The game involves brief exposure to words and reading aloud, since this has proven to be beneficial (Beeson and Hillis, 2001). If the player with aphasia cannot read aloud, another player would do it.



Once all the elements are placed on the board, each player rolls the die. The player with the highest number starts.

To start playing

Each player picks up three answer cards from the deck, and arranges them on the rack. Then, the first player picks up a question card and places it facing up on the Active Question area.



The following step is to check if one of the answers in the rack matches the question on the board. If it does, the player places the card on the active answer area, and reads it aloud.



If no answer card on the rack matches the question on the board, another card has to be taken from the Answer Deck. If it is not the correct answer, it is the other player's turn. Thus, the players continue alternating turns until the matching answer is found.



Once the matching question and answer are read aloud, the cards are placed on the Played Question and Played Answer areas.



After this step, another Question card is picked up from the deck, placed on the Active Question area and read aloud, and the sequence starts again.

The player who first gets rid of all the answer cards on hand wins, and moves the token one step forward.

The game lasts five rounds, taking into consideration that players with aphasia get tired very easily, and could have problems with attention span.

If the player with aphasia feels comfortable playing the first level and the family notices that the game is not challenging; s/he could try playing the second level of difficulty.

In the second level the patterns in the bottom right of the cards have been removed, and all the cards are the same colour.



8 | Evaluating the design response

In this section

Evaluating the prototypes

Analysis of the data

Activity

Customization

Content

Format

Layout

Color

Pattern

Text

Project

Summary Chart

Field interview

Design of the instructions

Informal conversation with the intended user

The expert interviews are discussed; interviews helped to evaluate the prototypes in relation to the research questions and to the details discussed in the previous section. A report on a field interview supplements the research with regard to the design of instructions. A report on an informal conversation with the intended user – a most important aspect of the evaluation process – closes the chapter.

Evaluating the prototypes

Through the reading package, some authors were identified as possible experts to contact. Interviews were conducted with seventeen leading experts, people recognised internationally in their fields for their substantial publication records, or professional activities. Eight experts in aphasia and nine experts in design were consulted for their opinions about the prototypes. The researcher travelled to New York and Boston (USA), Reading and Seven Oaks (England), Örebro (Sweden), Amsterdam and Arhem (Holland), Frankfurt (Germany), Bruxelles (Belgium), and Buenos Aires (Argentina); to interview the experts.

For the interviews, the two game prototypes *Goudy* and *Century*, were produced in English and Spanish (four game prototypes were created). Four interviews were conducted in Argentina, in Spanish, and then translated by the designer into English for this thesis project.

The “Expert interviews” were aimed at collecting opinions from experts, based on their knowledge and experience. The purpose of the interviews was also to confirm assumptions and reduce uncertainties regarding the design decisions applied to the prototypes. The two *Questions & Answers* game prototypes (*Goudy* and *Century*) were shown to experts in aphasia and in design. A list of questions was used to guide the researcher and the experts to help focus on certain aspects of the project. These related to playing as an activity to facilitate family interaction for people with Broca’s aphasia, the idea of customization, the content, the typeface used, the colours, colour to facilitate matching, patterns to facilitate matching, the size of the cards and the board, the use of racks, the layout, the grammar of the sentences, and typography.

The interview questions were organised into nine groups (see appendix B). All the groups related to **subquestions 1 and 7**, since all the responses to these groups helped to develop guidelines and assure the quality of the final prototype (see Summary chart in page 72 A).

The first group, *activity*, related to research **subquestion 2**, asking about game-playing as an activity to facilitate family interaction for people with Broca’s aphasia, the appropriateness of developing an activity to share with the family, its benefits, and length. Hence, the first group of questions was aimed at

confirming or challenging the assumption that a game could be a conversational tool to increase opportunities to interact with others and with language.

The second group of questions, *customization*, related to research **subquestions 3, 4, 5 and 6**, asking mainly about the idea of customization, and the use of family names; this group of questions was aimed at confirming or challenging the assumption that customization is essential in the area of aphasia; and that family names could increase the player's motivation.

The third group of questions, *content*, related to research **subquestions 2, 3 and 5**, asking about the complexity and length of the content considering the user's impairments and abilities. If the text were too complex or too long it might affect the reader's performance. Thus, this group of questions was also aimed at confirming or challenging decisions about the content, regarding facilitation of the interaction with language for players with aphasia, and how to make the game adaptable and usable by different individuals with aphasia.

The fourth and fifth groups of questions, *format and layout*, relate to research **subquestion 5**, regarding the size of the cards and board considering the users' impairments and abilities; and which layout options are easier to read, and make the task easier. The fifth group also related to **subquestions 2 and 6**. These groups of questions were aimed at confirming or challenging design decisions related to format and layout that would make the game adaptable, usable and appealing, while facilitating interaction with language.

The sixth group of questions, *colour*, related to the research **subquestions 3 and 6**, regarding the use of colour, and colour preferences (softer or brighter). It also related to the research **subquestion 5** since the use of colour in the game has two goals: to make the game appealing and to facilitate matching.

The seventh group of questions, *pattern*, related to the research **subquestions 2, 3 and 5**, since the use of patterns is designed considering different levels of reading impairment. Thus, these groups of questions were also aimed at confirming or challenging design decisions related to the use of patterns, that are aimed at making the game adaptable and usable by people with aphasia (particularly those who cannot read).

The eighth group of questions, *text*, related mainly to research **subquestion 5** asking about comfortable reading. It was aimed at confirming or challenging design decisions related to typographic layout.

The ninth and last group, *project*, did not relate to the research questions, it was aimed at confirming the need for research in the area of aphasia. However, given the responses, it does relate to **subquestions 2 and 5**, confirming

that game-playing could facilitate interaction, help people with aphasia to participate in activities and use cognitive skills, such as following rules.

A system was created to analyse the interviews (for a description of the system, see 'Analysis of the data' below).

To explain the project in advance, and make the experts aware about the nature of the interview, a booklet of 8 pages explaining the project and how the game is played was designed and sent to them. Taking notes while maintaining a conversation could be problematic; to solve this the researcher had an assistant who helped in taking notes.

Only one interview did not follow all the aspects in the questionnaire, since the respondent was an expert in the design of instructional materials, and the conversation focused more on the design of the game's instructions than on others aspects. This was modelled after the "field interview" method described by Neuman (2003).

Analysis of the data

Themes and patterns

The first step in the analysis was to select recurrent ideas and units of meaning in the responses and also reasons, i.e., "...valuable the idea of names and topics, otherwise there is no interest." The recurrent ideas were highlighted to help focus the attention on the most relevant parts of the text.

These units of meaning, expressed in short sentences, were organised in charts under the main subject they addressed (i.e. about the idea of customization). Given that the questionnaire involved nine groups of questions, nine charts were developed (see appendix D). At the top of the pages, a title informs the viewer about the group of responses analysed. The chart has a double entry. On the left is the category (aphasia or design) and number assigned to the expert; on the top, the main subject of each question.

The next step was to understand the main concept behind the units of meaning; if we analysed the example in the first paragraph, the main idea is that names or topics could increase interest; the main concept behind this is: "motivation." These main concepts are "sub-themes," and they were placed in the chart on a lighter area, below the units of meaning, to facilitate the task of the researcher when analysing the data.

The “sub-themes” were listed under the subject they belong to (i.e. family names), and later grouped, forming patterns called “themes.” For example, “an advantage,” “names are important,” “emotional connotations,” “beneficial,” “good idea,” “to assess relationship,” “depends on the relationship,” were grouped under the theme “names.” This theme entails the appropriateness, benefits, considerations and reasons to include or not to include personal names in the game.

All the themes were explained and their relevance and interpretation were analysed to construct arguments that helped to confirm assumptions and reduce uncertainties regarding the development of guidelines for the design of games for people with Broca’s aphasia. The following text outlines the responses under each question group. Appendix D includes the analysis chart.

List of themes

Conditioning factors

Facilitation

An alternative tool

Enjoyment and self-confidence

Social interaction a life goal

Activity

An analysis of the first group of responses of the interviews, *about the activity*, showed five main themes: *conditioning factors, facilitation, an alternative tool, enjoyment and self-confidence* and *social interaction as a life goal*.

CONDITIONING FACTORS

This theme related to *the players*, their cultural context, skills, history and feelings. If they live in a country where playing games is common for adults, if they are good at playing games, if they used to play games before, and if they would be willing to play a game, are all aspects to consider before proposing the activity to the players. The theme is also related to *the players with aphasia*, their personalities, set of interests, energy, tiredness, abilities, mood, attention span, preserved skills, etc.; and also to *the game*; how appropriate, fun, and easy it is to play. All these conditions together may affect the success of the game.

FACILITATION

This related to making family interaction less difficult, to helping develop the activity, and to promoting interaction. This suggests that a game could help to organise the sharing activity. It refers to the idea that game playing would make family interaction easier.

AN ALTERNATIVE TOOL FOR INTERACTION

A game could be another option for interacting and communicating. A customized game seems to be good for increasing participation opportunities, bringing people together, and generating links. Game playing could be a good excuse to invite people to focus on an activity and interact with others and with language, through exposure to written and spoken words.

ENJOYMENT AND SELF-CONFIDENCE

The theme suggested the pleasure and support involved in the activity. Game playing seems to be good at promoting activity, motivating, and helping gain confidence. It seems to be an activity that provides courage, stimulus, and joy.

SOCIAL INTERACTION AS A LIFE GOAL

We use speech as a tool of social interaction. When speech is impaired, isolation and depression are some of the psychological consequences we

experience. This theme refers to the significance of interaction in life. When interaction is possible, we experience emotional rewards, and a better quality of life, a life to share with others.

DISCUSSION

Responses to, "What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?" were mostly related to *conditioning factors, facilitation, and enjoyment and self-confidence*. The main idea is that game playing could facilitate interaction depending mostly on the patient and family background. If it was a patient and a family that used to play games and liked to play games, the activity would facilitate family interaction. Playing would be a good activity given that it is stimulating, enjoyable and fun. A few comments were related to the idea of playing as a non-linguistic communication, and the importance of the cultural context and the presence of children during the activity.

Responses to, "Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together?" were mostly related to the themes *facilitation, social interaction as a life goal, and conditioning factors*. It was suggested that it would be a good idea to develop an activity to share, and game playing would not only help to organise this sharing activity, but would also facilitate interaction, providing emotional rewards and a better life quality. The success of the activity would depend on the personal and family background, understanding the rules of the game, and instructing the family about the main purposes of the activity. It was mentioned that it would be positive to have an alternative tool to interact with the family and with language, through exposure to written and spoken words. A few comments were related to the limited time patients with aphasia are in hospitals, given health care system limitations; and that game playing to facilitate family interaction is an idea aligned with a new approach to the treatment of aphasia called "Life Participation Approach to Aphasia." LPAA is aimed at increasing life participation, even if language repair has not been yet addressed. It evaluates the patient's feelings, relationships, and activities in life to provide a supportive environment. Game playing could help provide a supportive environment, while increasing participation opportunities.

Responses to the benefits of game playing as an activity for people with aphasia mainly related to the themes *facilitation* and *social interaction as a life goal*. It seems that the main benefits would be to help make interaction within the family less difficult, and to encourage people with aphasia to participate in a group activity, thus avoiding social isolation. Also, the game could provide an excuse to help people with aphasia think, process language, use nonverbal cognitive skills, and show preserved skills (those unaffected by the stroke). Game playing might promote the wish to communicate, avoiding frustration if the use of language were not perfect, or the sentences meaningless. This might imply favourable psychological reactions, avoiding depression, rebuilding morale, and promoting well-being. Other responses indicated that it would be necessary to assess the personality, mood and ability of the player with aphasia, to see if it was possible to obtain benefits. If the person with aphasia was not in the mood to play, it would be better to try later. It was mentioned that to have alternatives to interact other than through a conversation, it would seem to be a benefit. A few comments related to the positive aspects of playing with children, for both the children and the player with aphasia, and also the benefit of playing a game designed for adults, and not for children.

Responses to, "how long should the activity last?" were related to the theme *conditioning factors*. The length of the activity will depend on the players, and the player with aphasia in particular. It might be necessary to assess several conditions before playing, like the players' mood and energy; and while playing, the players' excitement and attention span. If all the players seem to be having fun, it would be good to keep on playing. If, instead, some of them seem tired, distracted, or bored, it would be better to stop playing and continue the activity later.

Responses to, "other comments about the activity," were related to the themes *alternative tool for interaction*, *enjoyment and self-confidence*, and *facilitation*. A few comments were related to the requirement of understanding people with aphasia and their families in order to develop a project like this. It was mentioned that adult people with aphasia do not enjoy playing children's games. One expert indicated that the non-linguistic cues designed to match question and answer cards were a good idea, as they might help to build the aphasic player's confidence. The alignment of the project with the Life Participation Approach to Aphasia was suggested again, and this seems to be a positive aspect.

List of themes

Customization

Diversity

How to make it adaptable

Names

Customization

The second group of questions, *about the idea of customization*, showed four themes: *customization, diversity, how to make it adaptable, and names.*

CUSTOMIZATION

This theme referred to the benefit of designing an object paying attention to the personal profile of the user or users: what do they like? what do they want? what do they need? what can they do? how do they feel? how are they? how are their families? and where do they live, work and play?

If the game is customized for a specific user, this could be a benefit. The interest might be higher, the motivation and disposition to play better, and the specific deficit the person with aphasia suffers could be supported.

DIVERSITY

As much as people are all different, so are aphasia cases. People have different feelings, interests, families and experiences. People with aphasia also have different abilities and disabilities. This theme refers to the varieties of aphasia, and also to the difficulty of addressing the specific needs people with aphasia have. Diversity seems to be a key reason for customization.

HOW TO MAKE IT ADAPTABLE

This theme entailed the problem of how to develop a game that could be adapted to different users.

NAMES

Personal names are important; they carry meaning and information. They describe and represent in our mind a specific person, generating positive or negative attitudes and feelings. In this context, names could be a tool to increase motivation if they carry positive emotional connotations.

Families are social contexts where not everyone necessarily loves each other, or feels the same for each other. Since we are all different, we may feel closer to one person than to another.

DISCUSSION

Responses to, “What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter?” and “Why?,” mainly related to the themes *customization*, *diversity* and *how to make it adaptable*.

It seems that to customize the game might be a benefit. The player may show a better disposition to play if the topics interest him/her. The idea of customization seems to be quite important in relation to motivation. If the player were motivated to play the game, the task could be better performed. The main benefit of customization seems to be the possibility of addressing the specific language disabilities a person with aphasia suffers. At the same time, this would provide opportunities to show the preserved abilities, making the person feel good, since while the individual might not be able to speak, s/he might still be able to read, point, match, name, play or joke. In this sense, the benefit seems to be double, offering opportunities for practising the impoverished skills while using the preserved ones. Although the first aspect could occasionally cause frustration, the second aspect could generate positive psychological responses.

Customization seems to be the strategy to address the problems related to the varieties of aphasia cases; and diversity seems to be, as it was mentioned before, an important reason for customization.

Customization seems to carry a positive connotation within it, the idea of something special, personalised, designed specially for a certain person.

The problem that customization presented was how to make this game adaptable for everybody. The problem of how to obtain the resources to customize the game was also mentioned. A new design problem seems to appear. This is an important aspect to be considered if the game were to be mass produced. However, this aspect was not addressed in this thesis project.

A few comments were related to the benefit of making the game more generic. It was not clearly specified what “more generic” meant. If the topics were to be more generic, it should be defined how generic they could be. For example, if we were talking about art; what kind of art will be “generic” Canadian art, contemporary art, Renaissance art, or Italian Renaissance art?

Responses to, “Do you think that having the names of the family members of the patient is an advantage?” and “Why?,” were related to the themes *names* and *customization*.

Used carefully, having the names of the family members could be an advantage. However, there might be several factors that could affect the success of using the names of relatives. It seems to be necessary to assess the relationship between the person with aphasia and his/her family members, to avoid the use of names of those individuals whose relationship with the person with aphasia is problematic, and could cause negative consequences, like anger or sadness.

If the names were those of loved ones, they might generate positive responses. When reading or hearing the name of someone we love, we experience pleasure and joy, since we immediately associate the name with the person.

Playing a game with the names of the players seems to generate positive feelings and attitudes, a sense of belonging, linking and association, and a better disposition. In this sense, the names of the family members appear to be related to the idea of customization, making the game more relevant and special.

Proper names that refer to people involve different areas of our memory. All of us have sometimes experienced problems remembering proper names, a city, the director of a film we liked, etc.; but this problem never occurs if it were, for example, the name of our mother. People with aphasia could have problems remembering the names of the loved ones. In the experts' answers, a few comments were related to the difficulties of some people with aphasia to retrieve proper names. While for some experts it could be a problem, for others the game and the use of relatives' names seems to provide more opportunities to practice the access to and retrieval of personal names.

If the person with aphasia were not experiencing difficulties retrieving personal names, the use of them could also be an advantage because they are easy to remember given the positive association they carry.

One expert suggested that this problem could be solved by using images instead of words. This could be a solution but it will not provide opportunities to practise language.

Responses to, "other comments about the idea of customization," were mostly related to the themes *customization* and *diversity*.

List of themes

Simple and short

Different levels of difficulty

Difficult and complex

Content

Three main themes emerged from this group of questions: *simple and short*, *different levels of difficulty*, and *difficult and complex*.

SIMPLE AND SHORT

Considering that reading is a difficult task for people with aphasia, it seems to be appropriate to start with simple and short texts.

DIFFERENT LEVELS OF DIFFICULTY

Considering the differences among people with aphasia, it seems appropriate to develop different levels of difficulty, as much in texts as in tasks.

DIFFICULT AND COMPLEX

Reading is a difficult task for people with aphasia; regardless of the level of impairment, at some point reading would be difficult and the text linguistically complex. However, an appropriate level of challenge is advisable. As Griffith (1970) indicated, by playing the first level, the player without aphasia will know the individual's abilities and needs; observing the process it could be assessed if the person is able to do the task without effort or if it is too demanding. (p. 18)

DISCUSSION

Simple and short, and *different levels of difficulty* emerged in the responses to the first two questions of this group ("If we look at the complexity of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?" and "If we look at the length of the text...?").

Most of the experts agreed that given the difficulties that people with Broca's aphasia have when reading and when organising their thoughts, it would be appropriate to start with simple and short texts. This strategy might make the person feel comfortable, facilitate familiarity with the text, help avoid disorientation and frustration, and make the task easier.

Since the reading impairment will differ among aphasia cases, it would be pertinent to develop several levels of difficulty, in both the text and the task.

To facilitate the player's confidence, it seems appropriate to start with a task that is simple and not too cognitively demanding, like matching. If the game was to have a task focused on reading comprehension, it would be more cognitive and linguistically challenging.

This last aspect, the challenge, seems to be essential. If the task and the text were not challenging, the person would not really engage in the activity. The players would be satisfied at the beginning noticing that they can play, but then after, if the challenge is not there, they would lose interest. On the other hand, if the task was too difficult they would feel frustrated and not willing to try again, or even to try an easier level. Given this, it appears necessary to develop different levels of difficulty and to assess the players' abilities, to select the appropriate level that would be challenging, but adequate. It is here where the theme *difficult and complex* emerged. Support for this notion can be found in the literature:

It is axiomatic in aphasia treatment to begin where the patient is most likely to succeed with little struggle and to progress in small increments of difficulty. (Helm-Estabrooks and Albert, 2004, p. 236)

In LOT (language-oriented treatment), activities are presented in order of increasing difficulty to optimize opportunities for success and minimize feelings of frustration and failure on the part of the patient. (Bandur and Shewan, 2001, p. 632)

Responses regarding the length of the text also showed that when developing a task, or selecting the appropriate level of difficulty, it seems recommendable to consider the patterns that people with aphasia have, such as difficulties organising their thoughts, brief attention span, or feelings of disorientation.

Responses related to "Do you have any other comments about...?" did not show recurrent themes. They were related to suggestions, like the use of functional sentences ("I am hungry") or, to give room for individuals with aphasia to surprise us and use their intelligence to answer the question, instead of repeating the question. Positive and negative comments about the text were made. For some experts, the use of humour, and *wh* interrogative questions seemed positive aspects; for others, the issue that the answer is a question, and the extra spaces between words seemed negative aspects.

A few comments were related to the need for testing the complexity of the content with people with Broca's aphasia in order to know its appropriateness.

List of themes

Size of the cards

Materials

Size of the board

Racks

Aesthetics

Format

The fourth group of responses, *about the format*, showed five main themes: *size of the cards, materials, size of the board, racks, and aesthetics*.

SIZE OF THE CARDS

The theme related to how large or how small the cards should be, considering that a person with aphasia could have a weak or paralysed right arm; and also the purpose of use, and the context.

MATERIALS

This theme entailed the weight, rigidity and quality of surface that the card material should have in relation to the users and their needs.

SIZE OF THE BOARD

The theme referred to how large or how small should the board be, considering the users' needs, the purpose of the board and the context of use.

RACKS

This theme related to the appropriateness or inappropriateness of the use of racks in the game, their aesthetics, material, and other related issues.

AESTHETICS

This referred to the general appearance of the elements of the game: board, cards, racks, and tokens. It does neither include the rules' booklet, nor the box.

DISCUSSION

Responses to, "Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? Why / Why not?," were mostly related to the themes *size of the cards* and *material*.

It was suggested that the size of the cards (13 x 8 cm) was appropriate in relation to the hand (and different hand proportions) and easy to hold for someone with right-arm problems. The size of the cards seemed to be also appropriate in relation to the board and the movements required. The comments suggested that it was positive that the size was close to, but bigger than the standard cards. If the cards were bigger, it could cause some problems and make the person with aphasia feel patronised.

It was apparent that the cards must be fairly thick, easily cleaned, perhaps laminated, but with a non glare surface (to facilitate reading); while at the same time rigid and light weight. Specific measures of thickness were not suggested. Additional thickness and rigidity might facilitate the insertion of the cards in the groove of the rack.

Small number of responses were about the *aesthetics* of the cards, identifying positive features like the white frame, or commenting that the cards were nice, attractive, and similar to conventional playing cards.

Responses to, "...about the board game, is the size appropriate? Do you think that the racks are a good idea? Why | Why not?," showed three themes: *size of the board*, *racks* and *aesthetics*.

Most of the experts agreed that the size of the board is appropriate in relation to the sizes of tables, the cards and the movements required; the board was compared with other boards, it was mentioned that it looked like the ones in "a conventional game." The researcher was advised to avoid movements that require big distances; and to consider those patients that are bedridden.

For some experts, the board should be as plain and free of ornaments as possible. For others it was the opposite: it should have more ornaments, colours, and stimulating decorations. It was argued that the use of ornaments could be distracting, and it was suggested to avoid using them if the function was just decoration. The use of the patterns designed to facilitate the matching task on the board without a clear function could be confusing. On the other hand, it was argued that the board seemed to be the place to include all the fantasy elements and visual stimulus. Given that opinions are divided, I concluded that it is necessary to strike a balance on the board decorations: they should be visually stimulating without being distracting, and those elements that have a clear function in the game should not be used as decoration.

According to most of the experts, the racks might be appropriate. They make the task easier, leaving the hands free, while avoiding the use of the weak arm by the person with aphasia; or on the contrary, promoting its use for extra training. It was suggested to paint the groove with some colour to facilitate recognising it and putting the cards on the rack, to increase the size of the groove, and to consider improving the look of the racks. For some experts, the racks were complicated, could cause frustration, or were simply not necessary.

When confronted with contradictory advice, the researcher would ask the intended user or search for sources to deal with it.

Responses to, “any other comment about the format,” were related to the theme *aesthetics*, suggesting that the cards could have different colours on the back to facilitate the distinction of question cards from answer cards, and to use round corners to make the cards similar to the conventional ones and to avoid rapid deterioration of the corners.

A few comments were related to the tokens; while they seemed to be too simple to some experts, they seemed to be too demanding for others.

Future tests, beyond the scope of this thesis, will be required to determine a limited range of possibilities for the design of the tokens.

	<h2>Layout</h2>
List of themes	An analysis of the fifth group of responses, <i>about the layout</i> , showed four themes:
Layout preferences	<i>layout preferences, advantages, grammar and word separation to facilitate reading.</i>
Advantages	
Grammar	<h3>LAYOUT PREFERENCES</h3>
Word separation to facilitate reading	<p>Two different layout designs were shown to the experts. A first option set in Goudy used changes in size and style: text set in regular 18/26 pt, the key sentence in regular 28 pt, and the last sentence in italics; and it used bright colours. A second option set in Century Schoolbook used changes in size and colour background: all the text was set in regular 18/28 pt, the key sentence in regular 23 pt, on a lighter tone band; and softer colours were used. The second option had extra space between words, and between words and punctuation marks. The size of the punctuation marks was increased, except for the question marks (See appendix E).</p> <p><i>Layout preferences</i> related mostly to the experts' reactions regarding reading ease. The theme involved reasons for the statements, comments and suggestions to be considered.</p> <h3>ADVANTAGES</h3> <p>Reading depends not only on the reader's abilities, but also on the text's appearance. Typographic decisions, such as the type style and proportions; size; spaces between letters, words and lines; line length; and layout were made to guide the reader through the text. <i>Advantages</i> was related to those decisions that, according to the experts' preferences, resulted in an improvement in the layout regarding reading facilitation. It also encompassed suggestions about how to improve the layout .</p> <h3>GRAMMAR</h3> <p>A person with Broca's aphasia might have problems reading and/or writing articles, prepositions, and other short words with little meaning. <i>Grammar</i> referred to the appropriateness of including these "problematic" words in the text.</p> <h3>WORD SEPARATION TO FACILITATE READING</h3> <p>This theme involved the experts' opinions about using extra space between words, and between words and punctuation marks as a strategy to facilitate reading comprehension.</p>

DISCUSSION

Responses to, "Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?" related only to the theme *layout preferences*.

Most of the experts agreed that comparing the two layouts, the second option was easier to read. However, none of them mentioned that it was easier to comprehend the text. When reading, it is possibly hard to clearly differentiate between the various steps that the task requires; visual recognition of the word, dividing the visual stream into words, access to meaning, and access to word pronunciation. Probably the question has to be posed in a different way, or a task should be programmed to evaluate comprehension, for example, identifying a specific word.

One expert in aphasia mentioned that since the main task of the game is matching and not reading, differences in layout were not crucial.

When the experts mentioned why they considered the second option easier to read, the responses of the experts in aphasia were mostly based on word separation. Instead, the responses of the experts in design included comments about typeface selection as a feature that facilitated reading.

Suggestions were given by experts in design about trying different typefaces, and asking patients with Broca's aphasia what are they used to reading, and what they prefer when reading. One expert in aphasia advised considering the design of another version in a larger size.

Responses to, "Which of the differences is in your judgement an advantage: ...? and Why?" were related to the theme *advantages*.

According to most of the experts in aphasia and in design, the lighter colour band seemed to be an advantage when reading, a non-linguistic element that seemed to direct the reader's attention to the key sentence, helping to avoid failure and consequently frustration. The band seems to highlight the key sentence in a restful way.

The type selection for the second option, Century Schoolbook, was mentioned as one of the advantages. It seemed to have been used extensively in children's books, designed considering legibility issues, having better features and contrast compared to Goudy, and good differentiation between letters. However, only one expert in design precisely indicated using Century Schoolbook as an advantage.

Other aspects mentioned by the experts as advantages were: the use of softer colours; more generous spaces between words, between lines, and between words and punctuation marks; the strategy of using shorter texts; increasing the size of the punctuation marks; avoiding the use of italics; and combining the colour band with a larger type size for the key sentence.

It was suggested by experts in design that, since the last sentence has a different kind of information from the rest of the text, it would be beneficial to make it noticeable, i.e. by increasing its distance from the key sentence.

Some negative aspects mentioned by one expert in design were the small apertures in Century Schoolbook, and the extra space between words that seemed to be contradictory to the function of the serifs, thus disconnecting the words and making the text difficult to read.

Responses to, "Considering that the person suffers from agrammatism, would it be better for example to avoid the use of articles or ...?" entailed the theme *grammar*. Most experts agreed that it would be appropriate to include "problematic" words, presenting a correct grammar to the reader. Otherwise the text might be harder to understand, and it could also be insulting for the person with aphasia. The text should be grammatically correct, simple and complete.

A few experts in design indicated that they did not have an adequate background to respond to the question.

Responses to, "... will the 'linguistic' separation of words help the individual's comprehension of the text? and Why?" were related to *word separation to facilitate reading*. While for some experts the text was easier to read given the extra spaces but would not facilitate reading comprehension, for others experts the extra space would facilitate reading comprehension. It was mentioned that it seemed to be an appropriate decision when working with short texts, but the spaces should be consistent, and subtle.

Only one expert indicated that the strategy of using extra spacing could cause difficulties. In general, however, the strategy was found useful, although no reasons other than "it is easier to read" were given. One expert in aphasia indicated that the difficult task was to understand the meaning of the word, rather than to visually recognise it. In this sense, the use of extra or normal word space would not create a difference. Another expert indicated lack of arguments based on research to support this notion. Only one expert in design was able to provide knowledge and experience based on research in the area

of reading, suggesting that the strategy might work. However, the evidence noted was not specifically in the area of reading impairments in relation to people with Broca's aphasia.

I believe that the question could have been better formulated, and that the use of the word 'linguistic' was not appropriate, since the spaces between words were not decided according to a linguistic structure.

Responses to, "other comments about the layout" were mostly related to *advantages*, or were suggestions about where to place the pattern, other typefaces to try, and the issue that while the typeface is good, it is not perfect. An interesting comment was made by a design expert, who suggested that when one works according to specific needs, there is no typeface that could cover all the requirements.

List of themes
 Appropriateness of using colour
 Colour suggestions
 Colours to match
 Colour intensity

Colour

An analysis of the sixth group of responses, *about colour*, showed four themes: *appropriateness of using colour*, *colour suggestions*, *colours to match*, and *colour intensity*.

APPROPRIATENESS OF USING COLOUR

Colour can be used in design for different purposes. This theme indicated the suitability of using colour in this project as a strategy to make the game look like a game – without being childish and without causing legibility problems – while facilitating the matching of questions and answers. The theme also entailed reasons why, although some users could suffer from colour blindness, the use of colour in the project is appropriate.

COLOUR SUGGESTIONS

This theme related to ideas or recommendations made by the experts about the use of colour in the context of this project.

COLOURS TO MATCH

This theme referred to the use of colour to facilitate matching question cards and answer cards, the possibilities for the strategy to work, and its advantages and disadvantages.

COLOUR INTENSITY

Two colour palettes were used in the prototypes, one softer and the other brighter, (see appendix E) to make the game appealing to adults, while facilitating legibility; and to facilitate playing the game by matching. This theme alluded to the suitability of using one option or the other, and reasons why one intensity could be better than the other.

DISCUSSION

In response to the question, “Is the colour palette appropriate for this purpose?” two themes emerged, *appropriateness of using colour* and *colour suggestions*.

Regarding the first theme, the use of colour in the game seemed to be appropriate to make the game appealing to adults, and to facilitate playing the game by matching. Colour seemed to be an essential element in the aesthetics of games helping games look like games. Colour seemed to help the game look appealing, beautiful, and warm. Colour helped the game look as if was designed

for adults, not for children. It was suggested that the use of colour in the game seemed to be appropriate also because it helps players find the right answers.

Contrast was mentioned several times as an aspect to consider. Given that colour is used in the game mainly as background, colour contrast refers to the tonal relations between the black texts and their backgrounds. Not all the colours used in the prototype provided an effective tonal relation in regards to legibility. It was suggested to consult with specialists in dyslexia about the use of colour to facilitate reading.

Having twelve different colours that will always allow the use of text in black without generating uncertainties when matching, didn't seem to be feasible. If it were possible to use dark colours and reverse the text, it would have been possible to create a palette with twelve different colours, but it was decided to maintain black text on a lighter background since it is easier to read for many people.

Given that legibility is a main priority, it was suggested to create groups of content and use one colour per group. This would allow easy and fast colour differentiation, while avoiding legibility problems.

To facilitate colour recognition, it was suggested to use colours that players could name without hesitation. This strategy might help avoiding confusions, facilitating the task of matching, but could not work given that some users with aphasia could have problems naming colours.

One expert in design suggested to pay special attention to the importance of colour for the user, and to the colours in the environment where the user lives to determine the appropriateness or inappropriateness of colours in the project.

A few comments were related to avoiding the use of red as background colour, since this can cause reading difficulties; or to favour using yellow, given that it is the one for which human vision has the highest sensitivity.

The theme *colour suggestions* showed that there are some details to improve in relation to colour in the prototype.

Responses to, "Do you believe that colour could help the individual to match question and answer?," were related to the theme *colours to match*.

The assumption that colour could help matching question and answer cards, could not be generalised, given the differences among aphasia cases. Hale (2002), reported that:

There are some aphasics who can demonstrate that they experience colour normally; they can match different hues or put the correct colour on a black-and-white photograph of, say, a banana or grass. But they have problems naming or understanding the names of colours, and will frequently, for example, identify "blue" as "green." (p. 99)

While the strategy of using colour as a matching element seemed to work, another issue arose. If players with aphasia were to use colour to match the cards and play, they will not use language. In other words, matching is a simpler task than reading. One expert that had suffered from Broca's aphasia and recovered, mentioned that at the beginning, people with aphasia will try to mask their impairment using any strategy at hand. This last aspect showed that while the strategy could be used at the first level to help the player feel confident, it must be removed at some point if the goal is language interaction, through exposure to words. When the goal is language interaction, the non-linguistic means should be reduced, and eventually removed.

Some experts were uncertain about the merit of using colour to match, and others indicated that the pattern is a stronger element than colour, as a tool to facilitate matching. It was also indicated that given the subtle differences among some colours, the strategy might not work, be confusing or difficult. It was suggested that each card could have two colours instead of one, and that the two colour combination would help avoiding confusion.

One expert indicated that it is important to consider what the player with aphasia wants; does the player want to be helped by non-linguistic means? The only way to know is by testing the prototypes.

Responses to, "Which of the two options is more appropriate, the softer or the brighter palette?" were related to the theme *colour intensity*.

The softer palette was suggested to be more appropriate than the brighter. The main reason seemed to be contrast. A softer palette allows better contrast between the text and the background, facilitating word recognition, and reducing legibility problems. A brighter palette instead, seemed to be not only disturbing, but also included some colours that were too dark, reducing contrast and legibility. A few comments were related to aesthetic issues, indicating that a softer palette was nicer.

Responses to, “Do you have any other comments about the colour?” were related mainly to the theme *colour suggestions*.

It was suggested again to consult with specialists in dyslexia, and to use colours that could be named.

One expert suggested to use different colours for questions and answers in the back of the cards, to facilitate their quick distinction.

List of themes

The pattern

The pattern for a person without
aphasia

Pattern

An analysis of the seventh group of responses, *about the pattern*, showed two themes: *the pattern* and *the pattern for a person without aphasia*.

THE PATTERN

Given the reading difficulties that a person with Broca's aphasia could have, a pattern was used to help the person play by matching. This theme referred to the appropriateness of using a pattern to facilitate playing, the possibilities for the idea to work, suggestions to improve the idea, and its advantages and disadvantages.

THE PATTERN FOR A PERSON WITHOUT APHASIA

The theme related to the usefulness of the pattern for a person that does not suffer from aphasia.

DISCUSSION

Responses to, "Is the pattern appropriate for this purpose?" and "Do you think that the pattern could help the individual to match questions and answers?" were related to the theme *the pattern*.

The pattern might be appropriate for this project, since it could help people with severe Broca's aphasia to play the game by matching non-linguistic visual cues. For persons with severe reading impairments, or even for players with mild reading impairments who could at some point have difficulties with a word, the pattern would allow them to keep on playing the game despite their difficulties with language.

This non-linguistic element, located at the bottom right of the card, could be useful for people with right visual field defect; thereby having a therapeutic purpose by prompting the players to specifically look at the right side.

The pattern could also be useful for people with colourblindness, in which case colour would not work as a cueing aid.

The pattern seemed to help when the main goal is family interaction, facilitating playing the game by matching. When the goal is also language interaction, through exposure to written and spoken words in the form of brief questions and answers, this non-linguistic aid might help the person with aphasia by not having to use language.

As mentioned before, it is not possible to generalise and assume that the pattern might work in all aphasia cases.

One expert expressed the need to prompt players with aphasia to use the patterns, bringing to their attention that they are not just ornaments. On another occasion, it was mentioned that maybe some individuals with aphasia would not be able to distinguish different patterns. Research bases were not given, nor specific cases mentioned.

Some experts indicated the need to make the patterns very different from one another and from the shape of letters, to avoid confusions between patterns and between patterns and text. It was suggested that all the patterns should have the same tonal density, that they should be more separated from the text, and that they could be improved since some are easier to distinguish than others. A positive aspect mentioned was that they are not childish.

Responses to, "If you were one of the players without aphasia, would the pattern be useful for you?" were related to *the pattern for a person without aphasia*.

Most of the experts agreed that the pattern would not be useful for a person without aphasia. People without aphasia might only use it if they were tired, didn't want to read, or wanted to play faster. However, it was mentioned that the pattern could be of help for children, when playing the game with grandparents.

Responses to, "other comments about the pattern," did not show a specific theme, possibly because of the small number of answers given.

List of themes

Easier to read for a person without
aphasia

Content and appearance

Text

An analysis of the eighth group of responses, *about the text*, showed two themes: *easier to read for a person without aphasia* and *content and appearance*.

EASIER TO READ FOR A PERSON WITHOUT APHASIA

The theme referred to which of the two layout design options was easier to read for a person without aphasia, and why.

CONTENT AND APPEARANCE

This theme related mostly to comments about the content of the text and its general layout appearance.

DISCUSSION

Responses to, "If you were one of the players without aphasia, which of the two examples do you think would be easier to read?" were related to the theme *easier to read for a person without aphasia*.

Most of the experts agreed that, in comparing the two layout designs it was easier to read the second option set in Century Schoolbook (see appendix E, Layout design). It was indicated that the band, the word and line spaces, the bigger size, the softer colours, the typeface, the better contrast, and the fact that the text looks simpler and clearer made the text easier to read.

Responses to, "other comments about the text?" were related to the theme *content and appearance*.

Given that the question was about the text in general and not only the layout, some comments were made about the content. They indicated that it was a good idea to use humour and try to make people with aphasia laugh. It seemed to be positive that the main content of the game is questions, given that while people with aphasia normally try to utter sentences, they seldom try to ask questions. One expert in aphasia indicated that the text was not appropriate for a person with aphasia, without specifically explaining why.

Some experts noted that the text was beautiful, and that it would be better to avoid using unnecessary variations in the layout.

One expert mentioned that if a text is easier to read for people without aphasia, it would probably help people with aphasia. One of the main aspects to consider is to avoid fatigue (when reading).

List of themes

The project

Project

The ninth group of responses, *about the project*, showed a theme, *the project*.

THE PROJECT

This referred to positive and negative comments about the project in general, the game, the idea of working in the area of aphasia, and playing to facilitate family interaction. Suggestions were made about what and how to improve different aspects of the game.

DISCUSSION

Responses to, "What do you think about this research project?" and "any other comment?" were related to the theme *the project*.

The project seemed to be a good idea, since it is focused on an area with needs: games specifically designed for people with aphasia. The idea of the game as a tool to facilitate family interaction appeared to be very good. It was mentioned that if a person with aphasia uses a game in therapy, it is usually a game created for children; and if the game was to be a computer game, it would not foster interaction with others.

Gameplaying is a good activity for people with aphasia, they need to meet goals, follow rules, and develop action.

Another positive aspect in the project seemed to be the idea of working in and with the family.

It was indicated that the game could easily be adapted to therapy, or used as an educational tool although it was not designed for that purpose.

Several suggestions were made, such as: requiring actual answers; giving the player with aphasia the option to select an answer card from some possibilities; allowing people with aphasia to discover things, like the use of the pattern; making clear the goal of the game, to avoid confusions; and using closure or completion tasks to help develop confidence.

Some experts mentioned that it is not surprising that the family would learn about aphasia, and would try to develop some strategies to help the person affected, given that the family experiences the devastation caused by aphasia.

Experts' responses summary chart

Main research question	How could visual communication design guidelines be developed for the design of a game to increase opportunities for people with Broca's aphasia to interact with their families, and with language?								
		1	2	3	4	5	6	7	
Research subquestions		How could visual communication design guidelines be developed to design this game?	How could a game increase opportunities for people with Broca's aphasia to interact with ...?	How could this game be adapted to different individuals with Broca's aphasia?	How is this game adapted to individuals who do not like to play games or to interact with others?	How could the game be designed so that it is usable by people with Broca's aphasia?	How could this game be appealing to the users?	How will the effectiveness of the final testing prototype be assured?	
Interview topics and summary of questions	ACTIVITY Can game playing be an activity to facilitate family interaction?	CUSTOMIZATION Can customizing be a benefit for a specific individual?	CONTENT Regarding complexity of the text: which of the two examples do you think will be more appropriate?	FORMAT Is the size of the cards appropriate and easy to hold for...?	LAYOUT Which of the two arrangements ...will facilitate the ...comprehension of the text?	COLOUR Is the colour palette appropriate for this purpose?	PATTERN Is the pattern appropriate for this purpose?	TEXT ...For players without aphasia, which of the two examples do you think would be easier to read?	PROJECT What do you think about this research project?
Themes	Conditioning factors Facilitation An alternative tool Enjoyment and self-confidence Social interaction a life goal	Customization Diversity How to make it adaptable Names	Simple and short Different levels of difficulty Difficult and complex	Size of the cards Materials Size of the board Racks Aesthetics	Layout preferences Advantages Grammar Word separation to facilitate reading	Appropriateness of using colour Colour suggestions Colours to match Colour intensity	The pattern The pattern for a person without aphasia	Easier to read for a person without aphasia Content and appearance	The project
Summary of responses	<ul style="list-style-type: none"> Game playing could facilitate family interaction depending on the patient and family background. Playing is a good activity, it is stimulating and fun. It is a good idea to develop an activity to share with the family. Playing makes interaction within the family less difficult, encouraging the person with aphasia to participate in groups, avoiding social isolation. It makes people with aphasia think, process language, and use non verbal cognitive skills. 	<ul style="list-style-type: none"> Customizing is a benefit, the player has a better disposition to play and the task is better performed. It is important in relation to motivation. It makes it possible to address specific language disabilities. The use of names could be an advantage, it is necessary to assess the relationship. Avoid names of individuals whose relationship is problematic. Using the names of the players generates positive feelings and attitudes. 	<ul style="list-style-type: none"> Start with simple and short texts, to make the person feel comfortable, facilitate familiarity with the text, help avoid disorientation and frustration, make the task easier. The reading impairment will differ among aphasia cases. It would be good to develop different levels of difficulty in both the text and the task. If the task is reading comprehension it would be more cognitively and linguistically challenging. The challenge is essential. Assess the player's abilities. 	<ul style="list-style-type: none"> The size of the cards is appropriate in relation to the hand, it is easy to hold. It is also appropriate in relation to the board and the movements required. The cards must be thicker, harder, easy to clean, laminated, not shiny. The size of the board is good in relation to the size of tables and the cards. It looks like a real game. The racks are a good idea; they make the task easier, leaving the hands free, while avoiding the use of the weak arm. Paint the groove. 	<ul style="list-style-type: none"> The second option set in Century Schoolbook is easier to read, because: The lighter colour band directs the reader's attention to the key sentence. Century was designed considering legibility, and has good differentiation between letters. Softer colours; shorter text; larger punctuation marks and larger spaces between words, lines, and words and punctuation marks are good help. Grammar is correct, simple and complete. Otherwise it would be difficult to read. 	<ul style="list-style-type: none"> The colour palette is appropriate, makes the game look like a game, and appealing to adults. There is a need to check contrast with the text, to provide good tonal relations against black. The softer palette has a better contrast. The brighter is disturbing. It is not possible to have twelve different colours. Some colours are similar. Create groups and use one colour per group; use colours that can be named; and avoid those which produce legibility problems. 	<ul style="list-style-type: none"> The pattern is appropriate, it helps to play by matching non-linguistic cues. It allows people with severe or mild reading impairments to play by matching. It helps if the goal is family interaction, but not if it is language interaction. It is not possible to generalise and say that it will work in all aphasia cases. Make the patterns different from one another, and from the shapes of letters. The pattern does not help people without aphasia, but it could help children. 	<ul style="list-style-type: none"> Comparing the two prototypes the one set in Century Schoolbook is easier to read. The band, the word and line spaces, the bigger size, the softer colours, the typeface, the better contrast, and the fact that it looks simpler and clearer made it easier to read. It is positive that the main content is questions. Good idea, the use of humour and making people with aphasia laugh. If the text is easier to read for people without aphasia, it would probably help people with aphasia. 	<ul style="list-style-type: none"> The research project focuses on an area with needs: design for people with aphasia. It is a very good idea to use a game to facilitate family interaction. Games used in therapy are often designed for children. Computer games do not foster interaction. Good idea working in and with the family. Good idea playing, it is good for people with aphasia, they need to meet goals, follow rules and develop action skills.

For complete text of this summary see pages 50 - 72, and appendix D.

Field interview

Design of the instructions

As was explained in the description of the evaluation of the prototypes (see page 48), only one interview did not follow the interview questions. Since the designer interviewed is an expert in the design of instructional materials, the focus of the interview was the design of the instructions for the game, rather than the prototypes.

The interview took place in the office of the expert, and lasted for about 1 hour and 15 minutes. His responses can be summarised as follows:

- There is a need to constantly assess the contrast between colour backgrounds and texts.
- It is recommended to show the information of each step of the game with and image or with text, avoiding the omission of any step. Once one shows a process step by step, one should not change the strategy and skip steps.
- The board has problems, because the board and the back of the cards are the same colour. It is difficult to see when the space is filled or empty.
- It is advisable to use a colour for the background of the pictures that provides good contrast.
- The texts that relate to instructions about how to play, should be designed in a different way from the texts that provide clarifications.
- There is a need to edit the titles, relating them always to actions.
- Some colours are very close to one another. It will be advisable to reduce the number of colours so that they are easily recognised. The creation of groups or categories will allow to reduce the number of colours.
- It should not be difficult to verbally describe the differences between colours and between patterns.
- To facilitate reading, it is advisable to increase the space between letters according to the thickness of the strokes.
- The typeface used is one the recommended fonts by the Americans with Disabilities Act (ADA USA) and organisations of the blind.

Informal conversation with the intended user

Although the thesis is based on the case of my stepfather, I did not consider it appropriate to test the game with him. In my opinion, he associates a testing situation with therapy, and the therapy was a frustrating and humiliating experience to him. However, I think his opinions and advice are fundamental to the project.

To meet with AM it was necessary to travel to La Plata, Argentina. The conversation was held in Spanish and subsequently, I translated it into English for this thesis project. When asking a question, the structure was simple so that my stepfather could answer with words or automatic phrases that do not require grammatical construction: "yes" or "no," "I like it," "I agree," "Oh! well!" He also communicated through gesturing, pointing, performing an action and using body language. I did not take notes during the conversation to avoid interrupting it.

An evening while my stepfather and I were having dinner, I asked him whether he would be willing to give me advice about the game I was designing for people with Broca's aphasia as part of my thesis. We both agreed to meet specially for that reason, during an afternoon, in his house.

I arranged the elements of the game, and we started to simulate a game situation so he could understand the goal of the game and how it was played. I explained to him that some people with Broca's aphasia would not be able to read. Considering this, I designed patterns and used different colours to facilitate matching question cards with answer cards. He made me understand that these two elements were not necessary for him; he could read, but he understood that they could be useful for someone with severe reading impairments. Following this, I ordered the patterns one under the other, and asked my stepfather if some patterns were similar in his opinion. He pointed at all the patterns that have an horizontal line on the bottom. He also pointed at one made only of outline circles, and put this outside the group. He made me understand he thought there was something wrong there. It is the only pattern that used intersecting circles.

I explained that some patients could, like him, have problems with the right arm. In response to this, I designed racks to hold the cards, so that the reading angle was adequate while having the left hand free. He demonstrated with gestures that the racks were essential, that one could not have the cards on the

table while playing, because the other players were going to see them. He was apparently comfortable about not having to use his right arm. I noticed that some cards were slanted to the front, and my stepfather put them back in the proper position. The groove should be deeper to hold the cards correctly.

I told my stepfather that in my opinion, it was important to motivate the person with aphasia; he looked at me in agreement and nodded. I mentioned to him that I thought that using the family names was a good idea to motivate the player. He said: "Of course!" I asked "Do you think that it is important?" He said: "Yes." He seemed to be pleased about the idea of having his own name, and the names of his family members on the cards.

Without me asking, he showed me that he could match all the cards in the first level. He did that in less than 2 minutes, and looked at me challengingly, as if saying: "Is that all?" I said that there was a second level without patterns with all the cards having the same colour. He found the answer for each question of the second level very quickly, and did a gesture with his hands, as if saying: "Is that all?" I said: "Do you want more cards?" and he said: "Of course!"

I asked my stepfather which of the two levels he thought was better, he pointed at the first one (with patterns and colours). I said: "But don't you think that there are colours that are too similar?" He moved his right shoulder up, showing that for him that was not an issue. I explained that I thought about having fewer colours, and the criteria I was going to use, and he thought it was a good idea. He said: "Ah, well!" meaning it is okay.

I asked him if he thought the size of the cards and the board were good, and if the cards were easy to handle. He touched everything, and made a gesture showing that it was okay, he was not having problems with it. I mentioned that according to some of the experts I interviewed, the board was too plain, and needed more colour. He made the same gesture showing that it was okay to him. I told him that there was an interviewee who mentioned that it could be useful to differentiate the colour of the back of the answer and question cards; my stepfather thought it was a good idea, raising his thumb, meaning that he agreed. I mentioned to him that in another interview someone suggested to design the back of the card with a regular pattern like those of the standard playing cards. He said: "ahhhh!" showing that he liked the idea.

I mentioned to him that in my opinion the tokens were boring, and perhaps not necessary. He strongly disagreed, saying: "No!" and moved the tokens up and down, showing that for him it was important to see who was winning.

I asked him if he thought that while moving the token it would be better to have to perform another task, like kissing the other player. He made a gesture showing that he was not convinced about that, it was not relevant.

I explained to him, that for some people with aphasia, reading could be a very difficult task, and if he thought that the text in the cards was hard to read. He put the card farther away and removed his glasses showing (and being proud) that even without glasses he could read the text. After, I showed him the two prototypes, the one in Goudy and the one in Century Schoolbook, and asked him, pointing at the last line, which of the two lines was easier to read for him. My stepfather pointed at the prototype in Century Schoolbook.

I told him that the first paragraph in the text give us context, tells us a story. The second paragraph, is the key sentence, and to show this, it is highlighted.

The last line is off stage. I asked him whether it wouldn't be better if I made the last line different than the first paragraph. He said: "Yes."

I explained to him that given that situation, I thought it would be appropriate to have at least five levels of difficulty. The second level is the one without the pattern, the third level could have a longer text. He moved his hands, as if saying: "where is the third level?" I apologised, saying I haven't developed it yet. He smiled.

I asked him if he thought the game was a good idea, and he agreed. I asked if he would use it, he hesitated. Given that my mother died a year and a half after his stroke, he does not now have a daily family environment. I asked him if he thought it would have been motivating to play the game during therapy, he said: "Of course!"

AM was very pleased to be helping me; I believe it was the first time in three years that someone had asked him for advice. I believe that the experience could be beneficial to other researchers in both areas of aphasia and design.

Limitations

The small number of subjects with aphasia involved in the project can be seen as a limitation. Damasio (2003) noted that:

The scientific value of a single-subject studies is always limited. The evidence usually is a starting point for new hypotheses and explorations rather than the endpoint of an investigation. (p. 73)

However, in the area of aphasia, all evidence suggests that each individual is affected in a unique way, and that treatments and materials must be customized if their usefulness is to be maximised. All the decisions made and the guidelines developed for this project relate directly to the profile of the intended user. This is the limit of their validity. The project can be used as a model to apply to other cases, but its guidelines cannot be applied to any aphasia case.

Some readers could find the lack of scientific evidence in the responses of the experts as a limitation. However, the aim of the interviews was to collect expert opinions, based on professional experience. The interest in scientifically supported responses was not expressed by the researcher in any interview, since it would require a different involvement by the experts, an involvement that falls beyond the possibilities of this project.

The lack of information by the researcher in the area of colour perception in people with aphasia can be seen as a limitation. It was suggested to consult with specialists in dyslexia regarding the use of colour as background to facilitate reading, but this will not provide information about colour perception in stroke patients. Decisions about colour were based on general experience with non-aphasic people; and on the opinions of experts in design and in aphasia, and on the reactions of the intended user. They were not based on scientific research concerning the perception of colour among aphasic people.

The questionnaire created for the interviews showed some limitations. The question regarding the extra space between words was not well formulated, asking about "the linguistic separation of words," instead of the visual separation of words. Also, the question in connection with reading comprehension should be posed in a different way, to avoid a confusion between reading and comprehending the meaning of a word. The intention of this question was to ask for advice regarding typographic decisions about the perceptual problem of reading words, and not the cognitive problems of comprehending meaning.

9 | Conclusion

In this section

Discussion

Answering the research questions

Answering the subquestions

Answering the main question

Guidelines

This section starts with a brief discussion of the project. The research questions and subquestions are addressed, summarising the responses from the interviews and the conversation with the intended user. They reach a level of detail suitable for application to design production. The section closes with a set of general guidelines to consider for the design of games for people with Broca's aphasia, regarding the use of games to promote interaction with the family and with language.

This Master of Design thesis project began with the identification of aphasia as an area with needs, to which design could make a positive contribution.

The researcher recognised the language impairment suffered by people with Broca's aphasia, and the consequent lack of interaction with the family as important problems. The researcher proposed playing, and the design of a board game to increase opportunities for people with Broca's aphasia to interact with the family and with language, through exposure to written and spoken words. A system was created comprising: a tool, in this case a game which facilitates an activity; the activity itself, the playing of the game; and the interaction of the family which is facilitated by the playing of the game. If the system is altered, interaction might not be facilitated.

Given the variety among aphasia cases, the project focused on one specific case. Thus, the game *Questions & Answers* was created considering the user's abilities, disabilities, and interests. Two board game prototypes (named after the fonts used to design them), *Goudy* and *Century*, were designed to assess design decisions before the final design.

Interviews were conducted with seventeen leading experts in aphasia and in design, people recognised internationally in their fields for their substantial publication records, or professional activities. The researcher travelled to different continents, to consult with the experts regarding their opinions and assessment of the prototypes.

Overall, responses by the experts in aphasia and in design confirmed that game playing could be an activity to facilitate family interaction for people with Broca's aphasia, and that customization is essential to support the varieties of aphasia. The responses also supported the effectiveness of the design strategy, confirming the assumptions of the researcher.

A conversation with the intended user also supported the effectiveness of the design strategy, the approach and the methods applied.

In conclusion, the project showed that there is a possibility for constructive dialogue between design and aphasia experts for the development of materials in different areas of the problem, such as: a) diagnosis, b) rehabilitation, and

c) general interaction between the sufferers and their environment ('at home').

The project showed that in an area of highly specialised neurological problems, knowledge in visual communication design can help the development of materials and tools for people who suffer from aphasia.

Answering the research questions

The research questions will be answered starting with the subquestions, and finishing with the main question. To do this, responses from the interviews and the user are summarised. Some responses may answer to some degree other subquestions, but in order to avoid redundancy they are not repeated.

Answering the research subquestions

1. How could visual communication design guidelines be developed for the design of this game?

Following the identification of the disciplines related to the design of this game, heuristic evaluation, expert interviews, and literature review were the methods used to access relevant information. An informal conversation with the intended user confirmed assumptions and provided further information.

2. How could a game increase opportunities for people with Broca's aphasia to interact with their families, and with language?

Game playing could facilitate family interaction if the person with aphasia and the family used to play before the stroke.

- The game should be appropriate and the family should be instructed about the main purposes of the activity.
- The activity could help avoid social isolation, encouraging people with aphasia to participate in group activities, and prompting them to process language, to use nonverbal cognitive skills, and to show their preserved skills (those unaffected by the stroke).
- Playing with an appropriate game would promote the wish to communicate without feeling frustration, having favourable psychological consequences.
- It seems necessary to assess the attention span, mood, ability, energy and excitement of the player with aphasia in order to obtain benefits.
- The presence of children during the activity seems favourable.

Given the difficulties that people with aphasia have, it is appropriate to start with simple and short texts. This will help the player feel comfortable, and facilitate familiarity with the game and the text, while preventing frustration.

- The game should have different levels of difficulty in the text and the task.
- The text and the task must be challenging, otherwise the player will not engage in the activity and will lose interest.
- It is necessary to assess the player's abilities, mood and attention span to select the appropriate level. It is advisable to begin by playing the first level.
- The grammar should be correct and words such as articles and prepositions should be included.
- The use of humour and *wh* questions are appropriate.
- At higher levels the text could include functional sentences, and provide opportunities for people with aphasia to actually answer questions.

3. How could this game be adapted to different individuals with Broca's aphasia?

Customization is essential in relation to motivation and to the specific language deficits the person with aphasia suffers.

- Customization seems to be the strategy to approach the varieties of aphasia.
- Customization makes the game more relevant and it carries the connotation of something special.
- The main problem that customization presents is how to make the game adaptable to different persons with aphasia.

While this thesis focuses on one specific person, and its conclusions cannot be generalised, the process followed provides a model concerning the range of issues to be addressed in the process of designing and customizing a game.

4. How is this game adapted to individuals who do not like to play games or to interact with others?

If the person with aphasia and the family did not use to play games before the stroke, it is advisable not to try the activity.

5. How could a game be designed so that it is usable by people with Broca's aphasia?

The use of colour could facilitate matching question cards and answer cards, only if the person is not colour-blind, or does not have visual problems.

- The idea that colour could help matching cannot be generalised given the varieties in aphasia cases. On that topic, the researcher was not yet able to find information about colour perception in people with aphasia.

- Given the subtle differences among the colours used in the prototype, the use of colour to help matching might not work.
- To facilitate matching it might be advisable in some cases to use colours that can be easily named.
- If the goal is language interaction, through exposure to written and spoken words, colour should not be used as a matching tool.

A pattern might facilitate matching question cards and answer cards even if the person with aphasia is colour-blind. However, it cannot be said that it will work in all aphasia cases.

- The pattern will allow people with severe reading impairments to play the game, despite their difficulties with language.
- If the goal is reading comprehension, the pattern should be removed.
- This non-linguistic cue, on the bottom right of the cards, could be used to prompt people with problems in the right field to look at the right side. Therapeutic advice should be sought.
- The patterns should be different from one another, different from the form of letters, and all should have the same tonal density.
- It would be an advantage if the patterns could easily be described verbally.
- The pattern should be clearly separated from the text.
- The patterns would not be useful for people without aphasia, but they could help children to play.
- The patterns were not critical in this case, but they could be critical for players with severe reading comprehension problems. Nonetheless, the intended user pointed that some patterns could be improved.

The size of the elements of the game should be decided considering the user's impairments, abilities and movements required.

- The size of the cards, 13 x 8 cm, is appropriate and easy to hold for a person with the right arm weak or paralysed.
- The cards must be fairly thick, easily clean, with a non glare surface (to facilitate reading); while at the same time rigid and light weight. It should be easy to separate one card from others.
- If the cards were bigger, it could cause problems and make the player with aphasia feel patronised.
- A white frame helps to distinguish the front of the cards from their background.

- The intended user did not have problems handling the cards.
- The back of the question cards should have a different colour from that of the answer cards, to facilitate quick distinction between the two groups. The intended user supported this idea.
- The corners of the cards could be rounded to avoid deterioration.
- The intended user thought that a regular pattern on the back of the cards, like those in standard playing cards, was appropriate.

The size of the board should be appropriate for the sizes of tables, cards and the movements required.

- The colour of the back of the cards should be different from that of the board to easily note when the cards are on the board, or when the board is empty.
- The board should be visually stimulating, but not distracting.
- Visual cues that help playing should not be used as ornaments on the board.

The design and use of racks make playing easier, avoiding the use of the weak arm, and leaving the hands free.

- The groove should be deep enough to prevent the card from slanting forward. To facilitate its recognition, the groove could be painted.
- The intended user demonstrated that the racks were essential, helping prevent the other players from seeing his cards, and facilitating playing.

Century Schoolbook could be an appropriate typeface to facilitate reading for people with Broca's aphasia.

- Century Schoolbook was said to have good differentiation between letters.
- According to one expert, Century Schoolbook has small apertures in the "a" and "e." However, in the field interview, it was mentioned that this typeface is the one recommended by the Americans with Disabilities Act (ADA USA) and organisations of the blind.
- An important feature of Century Schoolbook is that, at a medium weight, it provides a very good contrast.
- It is advisable to avoid the use of italics, it increases reading difficulties.
- The distance between the key sentence and the last sentence should be increased to highlight their different functions.
- It might be necessary to develop a reading comprehension test, rather than discuss typeface preferences, to evaluate the quality and appropriateness of Century Schoolbook for people with aphasia.

Increasing the size of the key sentence and highlighting its area is appropriate to facilitate the recognition of the key sentence.

- The strategy helps direct the reader's attention to that area, helping to avoid failure and frustration.
- The lighter colour band was a feature selected as an advantage.
- The strategy is based on Gestalt principles of similarity: by increasing the size of the type, the key sentence gets segregated from the field because of differences in size; increasing the size also implies a darker tone in the sentence; the segregation gets reinforced by a lighter band in the background.

Increasing the size of punctuation marks could be beneficial, facilitating the recognition of periods, commas and semi-colons.

- Increasing the size of punctuation marks was mentioned as an advantage.
- The emphasis in the punctuation marks seems to be good. Given that some people with aphasia could have visual impairments, increasing the size of punctuation marks facilitates the recognition of units of meaning.
- The extra space between words and punctuation marks, according to an expert in design, is a good idea. It was done to emphasise the period and yet have it at the same tone as the word. This is based on Gestalt principles of proximity: if the period is too close to the word, both are seen as a unit. By increasing the space between them, the period is visually segregated. As a result, the period is more visible without being darker than the word.

Increasing the space between words seems to be effective, facilitating the recognition of words.

- To increase the space between words makes sense for the experts, mostly for the experts in aphasia. When composing a text on a computer, the space between words is set to recognise a sentence as such. Given the reading impairments that people with aphasia suffer, the spaces were modified to facilitate the recognition of words.
- The expert in the field interview advised also to increase the spaces between letters, to make them similar to the thickness of the stroke.

The intended user did not have problems when reading the *Century* prototype.

- The patterns were not necessary in his case; he was able to play by reading the cards. It can be assumed that the decisions made in connection with typographic details, such as typeface, size, spaces, use of upper and lower

case, and increasing size of punctuation marks, facilitate reading. However, it cannot be said that the user does not have problems comprehending some words, like for example, prepositions.

- More work in the domain of reading comprehension is needed.

6. How could this game be appealing to the users?

Colour seemed to be an essential element in games' aesthetics helping games look appealing to the users.

- Colour could be used to make the game appealing to adults, and to focus the attention on the text.
- Used as background, colour should be light in tone allowing the use of text in black. Given this, a softer palette seems more appropriate than a brighter one.
- It does not seem possible to have 12 different colours that can be easily distinguished from one another; it was suggested to create groups or categories. This will allow a reduction in the number of colours.
- Given that the intended user indicated the need to create more than 12 pairs of cards, the idea of using a different colour per pair is not possible.
- The intended user did not use colour as a matching tool; he was able to read. However, he preferred the first level with colours rather than the second level with all the cards with the same colour. He thought that it was a good idea to use a different colour per group of cards.

To use the names of the family members could be an advantage, only if they have a good relationship with the person with aphasia, and if the person with aphasia does not have problems with proper names.

- It is advisable to avoid using the names of those members who do not have a good relationship with the individual with aphasia.
- To use the names of the loved ones could generate positive feelings.
- If the person with aphasia has difficulties with proper names, the game could provide opportunities to practice, however, in this aspect, the advice of therapists is fundamental. An alternative could use names of professions.
- The intended user did not show problems when reading names, and was pleased about the idea. In his case, family names increased motivation to play and to read.

7. How will the effectiveness of the final testing prototype be assured?

The board, the cards, the colours, the patterns, and the instructions will be improved, following the advice of the experts and the intended user. A final prototype will be produced for testing, in the future.

Answering the main question

How could visual communication design guidelines be developed for the design of a game to increase opportunities for people with Broca's aphasia to interact with their families, and with language, through exposure to written and spoken words?

The answer to this question resides in the process that guided the work. There might be, of course, other ways to address the problem. Probably the process proposed could be used to develop other tools, and also in relation to other populations. The guidelines in these cases would be entirely different, depending on the users, the tools, and the situations of use.

This project presented a model of a process to develop guidelines for the design of games, a specific kind of game aimed at increasing opportunities for a person with Broca's aphasia to interact with the family and with language (see Design process chart on the next page).

The conversation with the intended user supported the value of the process followed and the decisions taken, as he showed that he could understand, read, and play the game successfully.

Applying the concepts learned, two other games were designed for the intended user. As it has been previously mentioned, the games were produced in English and in Spanish (see appendix F). The three games designed – the board game *Questions & Answers*, the pairing domino game and the matching card game – were played with the intended user in a family situation, and provided joy and interaction. The three games increased AM's opportunities to interact with the family and with language, through exposure to written and spoken words.

Design process chart



Guidelines

Based on the summary of the responses from the interviews and the user, that answered the research question and subquestions, a set of guidelines is outlined.

- Game playing could facilitate family interaction if the person with aphasia and the family used to play before the stroke.
- To facilitate language interaction it seems appropriate to start with simple and short texts. This will help the player feel comfortable, and facilitate familiarity with the game and the text, while preventing frustration.
- The customization of the game is essential in relation to motivation and to the specific language deficits the person with aphasia suffers. It seems to be an effective strategy to approach the varieties of aphasia.
- If the person with aphasia has severe reading impairments, the use of colour could facilitate matching question cards and answer cards, only if the person is not colour-blind, or does not have visual problems.
- A pattern might facilitate matching question cards and answer cards if the person with aphasia has severe reading impairments, even if the person with aphasia is colour-blind.
- The size of the elements of the game should be decided considering the user's impairments, abilities and movements required.
- Century Schoolbook could be an appropriate typeface to facilitate reading for people with Broca's aphasia.
- Increasing the size of a key sentence and highlighting its area could facilitate its recognition.
- Increasing the size of punctuation marks could be beneficial, facilitating the recognition of periods, commas and semi-colons.
- Increasing the space between words, and between words and punctuation marks, seems to be effective, facilitating the recognition of words.
- The use of colour seemed to be an essential element, helping games look appealing to the users.
- The use of family names could increase motivation to play and to read, only if the members have a good relationship, and if the person with aphasia does not have problems reading proper names.

NOTE: for detailed information about each guideline see pages 79 to 84

Future research

Further to the limitations previously outlined, it seems necessary to develop research in the following areas:

- A specific test should be developed and implemented with different people with aphasia regarding reading comprehension.
- If it is possible or desirable to develop scientific evidence concerning the issues addressed in the questionnaire to experts, expert interviews are not the appropriate method. Commissioned research should be funded to generate reliable guidelines.
- It would be necessary to develop more research in the area of colour perception in stroke patients, and how this differs from colour perception among non-aphasic people.
- A specific test should be developed and implemented with people with aphasia regarding reading comprehension.
- The game should be tested (played) with more people with Broca's aphasia.
- Is Century Schoolbook the best typeface to use for readers with aphasia? Tests should evaluate and compare the performance of this typeface against others typefaces recognised for their legibility.
- Could Century Schoolbook be improved by altering some details? Which details?
- Do players with aphasia want to be helped by non-linguistic cues?
- Do the patterns work for different players with aphasia?
- How can games be designed so that they can be customized for different people with aphasia?

RECOMMENDATIONS

In conclusion, I would recommend that children's materials must not be used for adults with aphasia. The negative feelings experienced by the users far outweigh the advantages they could offer.

A supportive environment is absolutely necessary: a family or a group of friends willing to interact with the intended user. The family context is an essential dimension, given that it constitutes the main aim of the game: to increase opportunities for family interaction. Simply buying or having the game will not suffice.

A learning experience

Personal statement

Working on this thesis contributed to my own skill development in visual communication design, design research, social design, aphasia, the use of games, and a number of other areas.

I learned that the design process and methods do not specifically pertain to the design domain; designers borrow methods from other disciplines, mostly from the social sciences, to apply to the design process. I used to think that the final goal of design was the creation of an object. Today, I believe it involves not only the object but also the activity and the situation of use. However, how could a designer create such a situation? I think that we intend to do this by training, educating, and communicating with the users; many times, it is even necessary to design specific materials for these tasks.

The design process is dynamic, it constantly changes in shape, it goes up and down, and on occasion the researcher gets trapped in a web, surrounded by noise, and it is difficult to stay on track.

"Research methods," is in my view too broad a term. The methods are used throughout the process for different purposes and in different circumstances. It is important to know what one needs to find, learn, know, or evaluate to be able to choose the appropriate method. This project could have used different methods and approaches if the user and the designer had been in the same city, or even in the same country. Perhaps I could have applied a more participatory design approach.

I learned to design for people with specific needs, and apply my knowledge in design to facilitate the use of the game. I learned how to facilitate reading for people with reading and visual impairments, and as a consequence, my knowledge about reading as a cognitive process increased. This prompted further development of my knowledge of typography.

I certainly improved my writing and reading abilities in English. Some of the articles and books in the area of aphasia were quite difficult for me, considering that I was unfamiliar with the field. Writing a long document was a challenge that introduced me to the problems of editing text for consistency, clarity of organization and written expression.

I improved my ability in relation to finding information about a topic, using a variety of strategies. I learned to make effective use of the library system that I have access to through the University of Alberta. I also improved my skills in connection with data analysis and with the use of published research to support my arguments.

I developed my interpersonal skills through my need to contact experts in the fields of my thesis. Every time I met with experts, I had to briefly introduce the project and, depending on their expertise, provide the information they needed to better understand it. For an expert in aphasia, it was not necessary to explain what it is, how a person who suffers from aphasia feels, and how is the situation at home. For an expert in design, it was not necessary to explain how the use of typography could facilitate reading for those persons with reading impairments.

From the informal conversation with AM I learned that the game I thought was complex, difficult, and according to some people, impossible to play for him, was quite appropriate. However, more cards need to be developed, and possibly more levels of difficulty. I thought it was important to mention this experience in the thesis; it was a benefit for my stepfather since he had an occasion to show his abilities and his judgement. It was a benefit to me; he showed me how to improve the game, what was appropriate or inappropriate, what was relevant, and what was not. It gave me confidence about my project, and how it could be improved for final production.

I was fortunate to be invited to make public presentations about my thesis while I was working on it. This helped me to develop my ability to summarize the information and to adapt it to different audiences.

The first lecture was in September 2005, at the Annual Meeting of the International Aphasia Association (Örebro, Sweden). The meeting involved professionals from the area and people with aphasia who had recovered their speech. The focus of the lecture was to show how design could make a possible contribution in the area, and how the games work.

The second lecture was in February 2006, at the Glenrose Rehabilitation Hospital (Edmonton, Alberta, Canada). The main audience was speech therapists, the focus was to explain the aspects to consider for the design of the games, and the experience of using them with my stepfather.

The third lecture was in May 2006, as part of the "Letras Latinas," a biennale of typography (Buenos Aires, Argentina). The focus of the lecture was to explain how, through understanding the reading process and possible impairments in people with aphasia, typographic decisions were made and the cards were developed. It also described my stepfather's experience with the game. After the lecture, a discussion was held with a neurologist who specialised in intensive stroke therapy, and two speech pathologists working exclusively with aphasia.

The interviews and the lecture in Buenos Aires presented a new problem, the language. In the case of the interviews, the translation was from English into Spanish in terms of the interview questions, and from Spanish into English of the interview responses. The development of the project in English and Spanish was an interesting experience that made me face new design problems. For example, when translating the game *Questions & Answers* from English into Spanish, it was necessary to re-think the size of the area for the text in the cards, given that in Spanish a question not only ends with a question mark, but also begins with one.

The public presentations forced me to think about other users and situations. For example, if people were not able to read proper names, names of professions could be used. The professions should be selected considering the user's profile. For the Spanish version of the Matching card game, the topics were: Argentine soccer teams, Argentine politicians, family names, and classical musicians; these are four topics that AM likes. Instead, for the presentations in Europe and Canada, the topics were changed to facilitate the audience's understanding of the idea of customizing a tool for the user. In this case, the topics were: European soccer teams, famous cars, international politicians, and classical musicians.

I learned that my identification of aphasia as an area with needs was appropriate, since both designers and aphasia experts saw new possibilities for interaction that they had not considered before, for instance, regarding the design of materials for diagnosis, rehabilitation or use at home.

Last but not least, designing using a user-centred approach for a highly specific user was a good learning experience. AM provided a specific frame for the design response. He is a man who likes certain kinds of things; his preferences and abilities allow me to better understand the problem and develop an appropriate design response. What began as a personal journey, has helped me to grow as a designer.

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Appendix A Sample of icons designed



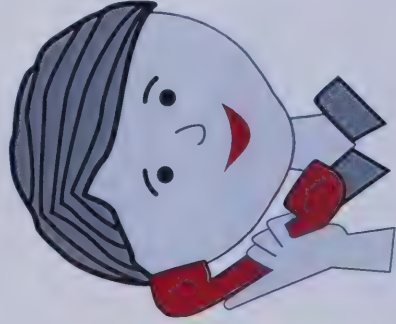
Please, hug me



I can't understand



I'm tired



Please call ...



Thanks!



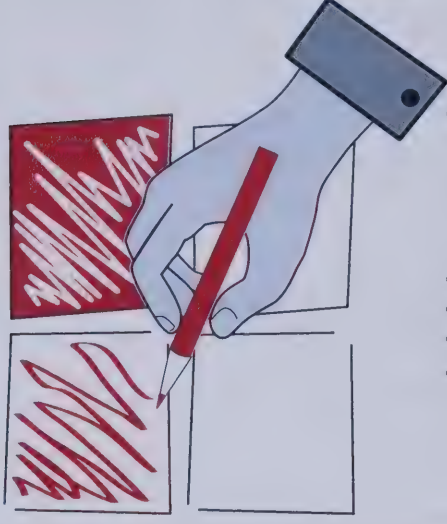
I want to sleep



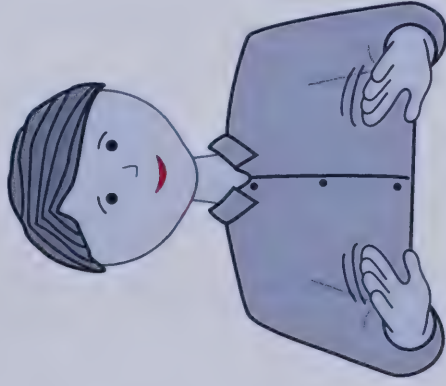
Just a minute



Go for a walk



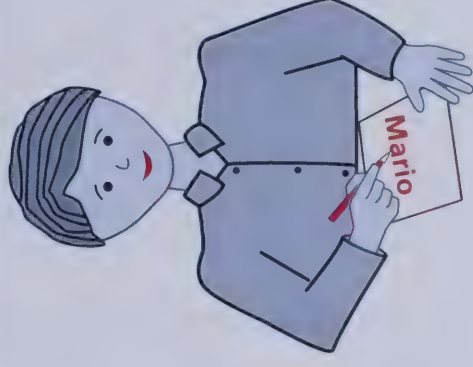
I would like to draw



Slow down



I would like to read



I would like to write

Appendix B Expert interview questions

About the activity

- 1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?
- 2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?
- 3) Could the activity be beneficial? Why / Why not?
- 4) How long do you think the activity should last? Why?
- 5) Do you have any other comments about the activity?

About the idea of customization

- 6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?
- 7) Do you think that having the names of the family members of the patient is an advantage? Why?
- 8) Do you have any other comment about the idea of customization?

About the content

- 9) If we look at the *complexity* of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?
- 10) If we look at the *length* of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?
- 11) Do you have any other comment about the content?

About the format

- 12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?
- 13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

14) Do you have any other comments about the format?

About the layout

- 15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?
- 16) Which of the differences is in your judgement an advantage:
lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?
- 17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence? Why?
- 18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?
- 19) Do you have any other comment about the layout?

About colour

- 20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?
- 21) Do you believe that colour could help the individual to match question and answer? Why?
- 22) Which of the two options is more appropriate, the softer or the brighter palette? Why?
- 23) Do you have any other comment about the colour?

About the pattern

- 24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?
- 25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

27) Do you have any other comment about the pattern?

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

29) Do you have any other comment about the text?

About the project

30) What do you think about this research project?

31) Do you have any other comment?

THANKS!

Appendix C Expert interviews

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

It is **good** as long as the family had played before, and was participating in activities with the person with aphasia before the stroke. A new game is not a problem.

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

It is very **positive**. Sometimes caregivers want to have something to do. It is good to have a new thing to do. Why? It is good as a clinician to get families to find **other ways of interacting**. It is good to have **structures at home** after the 6 to 8 weeks rehabilitation period. **Rehabilitation** here (at the Glenrose Hospital) **lasts** very little. **A maximum of 6 weeks**; some people can qualify for the "outpatient program," but not all of them.

3) Could the activity be beneficial? Why / Why not?

Yes, for sure **it is beneficial**. It **structures communication without being goal-oriented**. It is **an option for practising communication in a casual and social way**, rather than in a therapeutic one.

4) How long do you think the activity should last? Why?

No more than **half an hour or 45 minutes**. You have to consider also the caregiver, the person that is playing is enjoying; **playing is a more natural interaction than** what we try to do in **therapy**.

5) Do you have any other comment about the activity?

It is wonderful you took an interest in aphasia to do this! It is **good the idea of matching information symbols and colours**. I can see it is **adaptable** for clinicians to use **for therapy**.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

It is **really valuable the idea of names and topics**, **otherwise there is no interest**. The person with aphasia can decide what level he/she would like to play at.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

It is **an advantage**, it represents **more opportunities to practice**.

8) Do you have any other comment about the idea of customization?

It is **nice** that it can be customized, **there are so many things you can do**.

About the content

9) If we look at the **complexity** of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

I think it is great that it is bigger and it is different in colour. The **simpler text is better**, more appropriate. **It is good to start with something simple and make the patient feel comfortable with the task**. If it is too simple **you can have a second level of difficulty** or even more.

10) If we look at the **length** of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

Both versions are good, you can **start with the shorter version and then increase the length**. It is valuable to have a longer version. You will help **the person feeling avoid frustrated**.

11) Do you have any other comment about the content?

Only one suggestion, **it will be valuable to use functional phrases**. Phrases that the patient can use, basic functional comments like: "I am hungry," "I am thirsty," "Too loud," "I want quiet." **It will be good if they are specific and practical for that person**.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

The size is good, it seems to be **in relation with the hand**, it is not too big or too small.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

The size of the board is **good**, at least **on this table**. I would like to have a **clean board**, **if something doesn't have a function don't use it**.

The **racks are very good**, I like that the players don't have to have the cards in their hands.

14) Do you have any other comment about the format?

No.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

I like the **extra spaces in the new approach**.

16) Which of the differences is in your judgment an advantage: lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

I think that **the band** is very good; it is highlighting the answer. **The shorter text** is also an advantage as it was explained in another question. I don't think that increasing the size of the punctuation marks will help, it is not that important. I think that the patient will prefer the **lighter colours**; it is **easier to read the text**.

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

It is good to have a **complete grammar**. I don't remove the articles when I talk with the patients. To remove the articles will not be good, it will be insulting.

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

It is easier to read for me, but **I don't think it will help the individual's comprehension**.

19) Do you have any other comments about the layout?

No comments.

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

I don't think it isn't appropriate, the colours are soft, they are nice; so I will say it is appropriate. The **colours make the game look like a game**.

21) Do you believe that colour could help the individual to match question and answer? Why?

Sure, it takes language out of it, and **the task becomes a simpler task than reading**. It will not work with colour-blind people.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

The **softer palette** is more appropriate, it is **more contrasting** with the text; I like these colours. Make sure the colours contrast well with one another.

23) Do you have any other comments about the colour?

Colour will not make or break the success of this game. The patterns also help.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

It can be useful, mostly for colour-blind people.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

Yes, but patients will need to be prompted to use it.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

No, I don't think so. I will read.

27) Do you have any other comment about the pattern?

It should be optional.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

The new option is easier to read because of the band.

29) Do you have any other comment about the text?

No.

About the project

30) What do you think about this research project?

It is good to see someone outside of the problem deals with it. Sometimes people with someone aphasic in the family get to know something about the problem. You did not only learn about aphasia.

31) Do you have any other comment?

This is more that just visual communication.

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

Great idea! Fabulous idea! Playing can help people with aphasia and their families to fulfill one life goal, that is, social interaction. Activities are a very good reason to interact socially, and playing can facilitate interaction.

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

Absolutely, aphasia is a disorder that affects the whole family. When the patient goes back home after hospital discharge, in many cases communication will be limited, causing the social connection with others difficult. This has psychological consequences, such as social isolation. It is very positive to develop an activity to promote participation.

3) Could the activity be beneficial? Why / Why not?

There are two reasons for communication: transaction and interaction. The social goals of communication are as important as the exchange of information. These are not just for people with aphasia. The game fosters both aspects.

4) How long do you think the activity should last? Why?

It will depend on the players, individuals with aphasia vary and so does attention span.

5) Do you have any other comment about the activity?

The Life Participation Approach to Aphasia discussed in chapter 10 of my book emphasized that it is useful to capitalize on the strengths of the patients: and the game is a potential tool to increase participation opportunities.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

Yes, it could be a benefit. As I mentioned before, individuals with aphasia vary; a topic that can be interesting for some patients, will not necessary be interesting for others. The game could be done electronically and adaptable to others.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

It is an advantage, but it has to be used carefully because word frequency is related to the ability of the patients to recall words. Individual's names are not used frequently and so the names of even very close relatives are forgotten. This could cause difficulties.

8) Do you have any other comment about the idea of customization?

No.

About the content

9) If we look at the **complexity** of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

The **new system** has a better language. The **reading impairment will differ** among people with aphasia, they could for instance fail to read some words, or need more time to read others. It would be good **to start with a simple sentence**, to **facilitate familiarity with the text**.

10) If we look at the **length** of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

As I mentioned before, **reading impairments will differ from person to person**, I will suggest **starting with simple and short words or sentences**.

11) Do you have any other comment about the content?

Reading aloud as part of the game is a **good idea**.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

The **size of the cards and the board are appropriate**. The **board is a good size in relation to tables**, and the **cards are light in weight** and a good size, and **easy to move**.

13) What about the game board, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

The racks are a good idea, **the material is good**. It is **light** and will be **easy** for individuals with aphasia **to handle**.

14) Do you have any other comment about the format?

No.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

I like **the spaces and the font in the new approach**.

16) Which of the differences is in your judgement an advantage: lighter Colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

The emphasis on the punctuation marks is very good, and so is the highlighting of the band behind the key element. It could be possible that some people would have visual impairments, this will depend on the person, but it is good to visually facilitate the recognition of the end of the sentence. The band is a non-linguistic element that can facilitate the identification of a key sentence. It is like having someone waving the hand in front of you.

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

The grammar should be always complete, if you omit short words like articles or prepositions the text could be even harder to read.

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

It seems easier to read to me. But the problem of people with reading impairments is not to recognize the words, but to comprehend them.

19) Do you have any other comment about the layout?

No.

About Colour

20) Is the Colour palette appropriate for this purpose? Does this matter? Why / Why not?

This is lovely; it is appropriate for an adult and not childish. I think that the red in the old version was not a good idea, it is very hard to look at, too bright, too strong.

21) Do you believe that Colour could help the individual to match question and answer? Why?

The visual cues are a great idea, but I cannot say it will help to match questions and answers, sometimes the Colour differences are too subtle. As you know individuals will differ, it can work for some, but not for others. You will have to test it.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

In the softer one the text is easier to recognize and the Colours are not disturbing.

23) Do you have any other comment about the Colour?

No.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

Yes, but it depends on what you want to achieve. If you want the person with aphasia to feel comfortable playing, and keep them from feeling frustrated because of their reading impairment, it is good. But if you want them to read, the pattern could be distracting.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

Like in the question about Colour, the idea is fantastic. Even for me it is useful, but I cannot say it will work in all the aphasia individuals. It would be necessary to test it.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

I think it is a great idea; I just look at the corner and I know if it is the right answer.

26) Do you have any other comment about the pattern?

No.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

The second one is easier to read, the words are easier to see, the lines are not too close. It seems properly done.

29) Do you have any other comment about the text? Why?

It is beautiful.

About the project

30) What do you think about this research project?

It is not about therapy, but it could be adapted, and it is very good for interaction. Nobody has done this kind of thing that I know of. It is a great idea! You did a great job. I like your idea a lot: participation and social approach. Well thought through.

31) Do you have any other comment?

Other games could explore "closure tasks," that is, the completion of a sentence such as "salt and ..." This would take advantage of existing expressions that may not require the actual the composition of sentences. This could be used to develop confidence in the individual.

The game with just one word is a good idea, perhaps the theme could be food, which is something that everybody likes.

The back of the cards should not be too complicated.

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

I think it is very good if the family used to play before. Not many people with aphasia like to play games.

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

Yes, it is very good. Why? It is important to play, especially in families that have children. The person hurt by aphasia could be brought back to the family by playing.

3) Could the activity be beneficial? Why / Why not?

As you know I was 37 when I had the accident. I have six children; they were young and were laughing at me. Playing for them was very good, and it was good that I had the time for them. They were happy about having a father playing with them at home.

It is very important to make a difference, this game is good for adults.

4) How long do you think the activity should last? Why?

It should not last forever. A limited time is necessary, because people with aphasia get very tired. The players have to be sensitive to the behavior of the aphasic. The player with aphasia should not get too tired, he/she should be excited about playing.

5) Do you have any other comment about the activity?

It is important that the individuals have fun playing, this could take them out of the depression.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

It is good to have subjects that you like because if one likes the subject would be interested and would do the activity, but you should think about how to do it for everybody.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

Family names are important, they are easier to remember, and have emotional connotations. While playing you can show the person and direct the aphasic person to the name.

8) Do you have any other comment about the idea of customization?

No.

About the content

9) If we look at the **complexity** of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

Even the second option is hard for someone with severe aphasia, and would be difficult for him or her to read. Difficult but ok.

10) If we look at the **length** of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

I think it is good to have two different lengths and one that is easier than the other, it will allow you to have different levels of difficulty. You can start with the shorter level and then pass on to the longer one. It would be important, it means that there will be more people with aphasia that can play the game.

11) Do you have any other comment about the content?

The answer is a question, but by learning the game you learn the logic of the game and it is ok. What is important is that the person with aphasia understands the question. It can bring the person with aphasia to think. Did I understand the question?

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

The size of the cards is good, it would not be a problem. The most important thing is to understand the rules of the game. The cards are very nice.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

The size is good, but it can be more attractive, with more pictures, there is no need for it to be so simple. The idea of the racks is good, but they can be nicer.

14) Do you have any other comment about the format?

Not about the cards or the board, but about the tokens. They are too simple, it must be more exciting to advance the tokens and maybe you need to go back sometimes. Maybe the line is not just a straight line, and you can introduce tasks that one has to perform while moving the token one step.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

The second option is easier to read. The distance between words makes it easier to read, but it should always be the same distance. It is of great importance. Usually the text with normal space is very difficult to read.

16) Which of the differences is in your judgement an advantage: lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

The lighter colour in the band and the larger size are very important. You can see the most important thing first. The colour is important in this case. I don't think you should explain this from the beginning because it would be too much, it is better to start playing and then to explain more details.

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

No, I don't think so. The grammar should be complete.

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

I think so. Words with "normal" distance are more difficult to read, as I explained before.

19) Do you have any other comments about the layout?

It looks very nice as it is.

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

The colours are attractive, but I don't think they are important. Probably the function should be explained from the beginning, but it is easier to use the patterns than the colours.

21) Do you believe that colour could help the individual to match question and answer? Why?

If they were all the same colour, like in the second level it will be harder to play. Will the first level be possible to play? You cannot say it in general because they are too many different forms of aphasia.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

The softer is nicer, the others are too strong.

23) Do you have any other comments about the colour?

No.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

The pattern is good, as long as you do not have to count elements.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

The patterns help; I think that they are a good idea, if one has problems understanding one word, one can look at the pattern.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

Yes, because of the same reason.

27) Do you have any other comment about the pattern?

No.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

The second option is easier to read for me, probably because of the space between words, or the letters that are bigger.

29) Do you have any other comment about the text?

I think that it is very good to try to use humor. It is good to have the person with aphasia laugh about something.

About the project

30) What do you think about this research project?

It is very good, it is good for people with aphasia to play games with the family, and there are no games for them. First I thought that the game was complicated. Now, perhaps it is too simple. You have to go step by step and allow the person with aphasia to find the solution.

31) Do you have any other comment?

Probably it could be good not to explain the issue of the colour and the pattern. It would be good for the aphasic person to discover things.

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

It is **good if the family used to play games before**. I have couples that play games in a therapeutic way.

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

It is a **great idea**. People with aphasia and their families have to change the way they interact. The game is **another tool to interact**. There would be a huge loss if they do not **communicate**. Sometimes they try to talk, but **they will give up if speech does not work**.

3) Could the activity be beneficial? Why / Why not?

Yes, **it encourages positive communication in the family**.

4) How long do you think the activity should last? Why?

It **depends on the patient**, if the patient is tired, or if he/she is enjoying the activity; there are many other factors.

5) Do you have any other comment about the activity?

I think **it is wonderful**. It is also following a trend that Fine Arts is being integrated with Medicine in therapy.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

It is a **good idea**. **Specific deficits can be appropriately supported through customization**.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

Yes, **it makes the game more** interesting for the patient, more **relevant**. I use family names with my patients. I had a patient that the only thing he wanted to repeat was family names; a lady couldn't remember her grandchild's name, so all that motivated her was to regain that name.

8) Do you have any other comment about the idea of customization?

No.

About the content

9) If we look at the **complexity** of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

It is **good to have more than one level**, and depending on the damage of the **patient**, or if the patient has a bad day, **you can use one level or the other**. A simpler version could be used for bad days. I also like the physical appearance of the second option.

10) If we look at the **length** of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

It is **good to start with a shorter version**; some patients have trouble organizing their **thoughts**. To have **different levels** allows you to use the game for a longer term.

11) Do you have any other comment about the content?

It would be good to treat apraxia.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

Yes, it is a good size. It is a little bigger than usual playing cards. I like the fact that there is a white frame, it will help people with visual field deficits.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

The size of the board is good in relation with the cards and the movements one has to do on it. It seems easy to use. The racks are good, so players can have both hands free.

14) Do you have any other comment about the format?

Brain injured patients might find ornaments too distracting. Patterns on the board can be confusing if they don't have a function.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

I like the physical appearance of the second option. One thing you want to consider: a special enlarged version available. Many geriatric people have visual problems, so you should consider using a bigger size. And even people that have field problems do better when the size is bigger.

16) Which of the differences is in your judgment an advantage: lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

The colour band and the chunked text are in my opinion an advantage, they are signs to look at. More distinct colours would be helpful. Certain colour contrasts are easier to read than white. I have patients that are not colour-blind but they are bad in colour distinction. The type seems clearer in the new option.

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

The grammar should be appropriate. Use simple but correct grammar.

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

I like it, I don't have research basis for my answer. I think we do that naturally when we write our own cards.

19) Do you have any other comments about the layout?

It is good that you use lower case letters, all in capitals would be harder to read.

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

A medium tone will be better, not that bright, not too saturated. Colours help the game look like a game, they are nice.

21) Do you believe that colour could help the individual to match question and answer? Why?

Yes, it is a simpler task than reading.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

I like the lighter colours in the new game (second option). It has a better contrast.

23) Do you have any other comments about the colour?

Some patients are not so aware about colour, but they could rely on the symbol. Colour makes the game more interesting, more attractive. Aesthetically your new high pitch colours are more pleasant to the eye.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

It is not absolutely necessary but **could be useful with certain people**. Particularly with **colour-blind people** or people that do not pay attention to colour.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

Yes, **the task is easier**. It **takes the task out of language and helps cueing**.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

It is faster; you don't have to read. Probably **I wouldn't use it**.

27) Do you have any other comment about the pattern?

No.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

The new option is easier to read. **The text is clearer, it looks bigger; the colour is softer**. It is aesthetically **pleasing**.

29) Do you have any other comment about the text?

I like the fact that it is prompting questions. **Sometimes the patients** say short sentences but **do not ask questions**.

About the project

30) What do you think about this research project?

It is a **great idea**.

31) Do you have any other comment?

No.

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

Even for healthy people playing is a stimulating and social activity, they sit around a table to play. Lots of Dutch people like to play games. In our culture it is quite common. With children one plays games all the time. It is fun.

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

Yes, it is very important for people with aphasia. For them to have social interaction is very hard. We have a game and it works.

3) Could the activity be beneficial? Why / Why not?

The most important thing is to have social activity because it will bring the wish to communicate. We have seen that with games people who had not talked started talking. When playing, language would come out spontaneously, often to the players own surprise as well.

4) How long do you think the activity should last? Why?

Depends on the game-addiction of the person. People with aphasia get tired very easily, probably it should last 15-20 minutes.

5) Do you have any other comment about the activity?

I think that the idea is great; lots of existing games in Holland are either too complex (adult games) or too childish. Adult people with aphasia don't like to play games that are obviously developed for (young) children.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

It can be very appealing, or, depending on private circumstances and preferences, too personal. General themes are fine. It is more appealing if it is a game that everybody can play. Yes, customization can be an asset.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

It can be tricky. It depends on the relation the patient has with others members of the family.

8) Do you have any other comment about the idea of customization?

No.

About the content

9) If we look at the **complexity** of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

You could use both options building up the level of difficulty. Longer texts could be introduced with non-linguistic aids and then removed. The challenge has to be there.

10) If we look at the **length** of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

Again you could have both. I would prefer in a 3rd or 4th level to have answers. The answer could be: "He is asking Carolina at what time she is coming."

11) Do you have any other comment about the content?

It would be nice to be able to play the game on 4 levels of difficulty.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

The size is ok, the cards are big enough. Too big could be cumbersome. The material should be different, it should last and be able to be cleaned.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

The size is good, if it were bigger it could be a problem for the usual size of tables. The racks are good.

14) Do you have any other comment about the format?

It is very comfortable to look at.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

The second option is better, it looks easier to read.

16) Which of the differences is in your judgement an advantage: lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

People with aphasia do not generally spell, but they recognize the word profile, so I believe that the extra separation of words is good. In the second option the type is nicer, clearer.

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

I would leave them in. Things should be as normal as possible. Even if it is a game to play, the language should be correct. I will always use correct language.

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

Yes, as I mentioned before.

19) Do you have any other comments about the layout?

The second option is easier to read.

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

I think it is important, it makes the cards nice, and helps one find the answer. You should ensure enough contrast.

21) Do you believe that colour could help the individual to match question and answer? Why?

Oh yes, it makes the task a lot easier.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

For the first level the softer version is better, but for the difficult level the first version with brighter colours is better.

23) Do you have any other comments about the colour?

People specialized in dyslexia might know more about how colours can facilitate reading.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

Yes, it is. It will be helpful for people that have difficulties reading.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

Yes, as I said before: it will help people to match the right cards without reading.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

I don't think the pattern will be an extra help for people that do not have aphasia (most people will just read the questions and answers). It may be helpful to children –we found out the game we developed for people with aphasia are played by grandparents with aphasia and their grandchildren. In this social interaction between grandchildren and grandparents a game can be very helpful.

27) Do you have any other comment about the pattern?

No.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

The second version is easier to read, the text is clear, bigger.

29) Do you have any other comment about the text?

It looks nice.

About the project

30) What do you think about this research project?

It is a very good idea. It could have actual answers. The board looks as having the right level of complexity, and the cards bring the colours in.

31) Do you have any other comment?

The colours could be more colourful but not bright. I like the idea of a pattern on the back of the cards, it makes them look like regular playing cards.

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

It is a great idea!

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

There is a new thinking that replaces the notion of impairment-based rehabilitation: focusing on social interaction and life enhancement. This movement is known as the Life Participation Approach to Aphasia or LPAA. This fits right into it.

3) Could the activity be beneficial? Why / Why not?

A game that requires individuals with aphasia to process language in a number of different ways such as understanding spoken words or reading written words is a good language stimulation activity. In addition games also require a number of nonverbal cognitive skills such as strategizing, monitoring correctness of moves, etc. These may or may not be preserved in individuals with aphasia. In people with impairments in these "executive functioning" skills, the game may prove therapeutic, and for people who have relative preservation of these skills, the game provides them an opportunity to demonstrate some of their preserved abilities, rather than always focussing on their losses from the aphasia. It is good to make them think.

4) How long do you think the activity should last? Why?

Maybe half an hour to an hour, depending on how stimulating and "fun" the individual feels the game is. In general language stimulation activities in therapy sessions would not be longer than an hour for typical treatment sessions.

5) Do you have any other comment about the activity?

Language is in the mind of the patient but it is not accessible. This is a way of trying an alternative to reach it.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

Customizing makes sense and is more likely to prove beneficial and perhaps to generalize to other aspects of the individual's life. Wonderful!

7) Do you think that having the names of the family members of the patient is an advantage? Why?

Yes, **names of family members are important** for many reasons. People with aphasia are often quite upset that **the names of their loved ones are no longer accessible to them for verbal expression**. If they could be **stimulated in a game** format, they may end up being **more accessible** later on.

8) Do you have any other comment about the idea of customization?

I liked the idea of building in **humorous aspects relevant** to the individual. For example, using the name of the patient's cat, so that he would recognize the anomaly of having the cat performing various activities. All of these things **increase the likelihood that the individual will be engaged with the activity**.

About the content

9) If we look at the **complexity** of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

I don't think that in this case there will be a significant difference, because **the task centers on matching**. There should be **another level** where the task becomes **reading comprehension**. In that case, sentence complexity will matter. In other words, **linguistic complexity is a much more important factor for people with aphasia than strictly formal complexity related to font types, sizes, etc.**

10) If we look at the **length** of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

In this case **the length is alright**, but **if the task were more designed to require reading comprehension you will need to provide the individual with more context, like in the Sentence Production Program for Aphasia (SPPA) treatment**.

11) Do you have any other comment about the content?

As stated above, the task would be **more cognitively and linguistically challenging and perhaps stimulating for language recovery if it required decoding of the text for meaning, rather than matching of visual information** as it currently is.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

The size is **good**. The overall design is **very attractive**.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

Excellent idea to have the card holders to compensate for people who have hemiparesis. However, it would be useful to make the groove wider in the card holder so that the cards sit back easier.

14) Do you have any other comment about the format?

You could use a card holder instead of a rack.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

The game is focused on matching rather than text comprehension, so in this sense the differences between the layout don't create that much of a difference. The band of light color is useful at the beginning level, but it could disappear after to increase the difficulty of the task.

16) Which of the differences is in your judgement an advantage: lighter color; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

The band works very well, because it makes the individual focus on that area. Like, saying here is where the important thing happens.

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

Keep the text fully grammatical: do not omit short words. Think of this as a reading comprehension game. Written text that purposely omitted functor words would look "odd" and perhaps be even harder to comprehend.

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

Word separation is not crucial. The difficult task for people with alexia and aphasia is figuring out meaning, not the visual perception component of reading.

19) Do you have any other comments about the layout?

No.

About color

20) Is the color palette appropriate for this purpose? Does this matter? Why / Why not?

It is good, I think it is beautiful. It doesn't look childish.

21) Do you believe that color could help the individual to match question and answer? Why?

Yes.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

The softer one. It increases the contrast between the background and the text.

23) Do you have any other comments about the color?

The overall color design is very attractive and pleasing. It looks "adult" in design unlike many therapy materials that are currently available for people with language difficulties.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

Pay attention to the location of the pattern. Left or right? It might be therapeutic to keep it on the right, considering that some patients have to make an effort to see the pattern, due to their possible deterioration of the right visual field. Therefore putting important information on the right might serve a therapeutic purpose of forcing attention to the right side of the space.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

The pattern will work well as a cue.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

I think people without aphasia will be variable as to whether they concentrate on the words versus the pattern. If you realize that you don't need to read the words to do the match, it may be faster simply to concentrate on the patterns.

27) Do you have any other comment about the pattern?

No.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

The new approach is more readable.

29) Do you have any other comment about the text?

No.

About the project

30) What do you think about this research project?

It is good for the patients because it forces them to learn to meet the goals, take turns, and develop matching skills. It would be useful to create another level were the tasks were more complex than matching, and required more complex linguistic and cognitive abilities.

If patients with aphasia use games in therapy they are usually children's games. There are no games designed for people with aphasia. There are computer games, like solitaire, that make the patients think, but they do not foster interaction with others.

31) Do you have any other comment?

It would be useful to create a game where patients have to respond to a question such as 'Who is performing?', having to select a card from several possibilities. I will be quite interested in using this game even if it is not conceived for therapy.

This game could easily be adapted to rehabilitation by changing some of the rules of the game to require reading comprehension and/or verbal expression skills on the part of the player.

I am impressed that you developed this idea without having any background in aphasic language disorders. Sometimes the best therapeutic ideas come from the loved ones of our patients, who are the ones who really experience firsthand the devastation that aphasia can produce in a family.

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

I don't like games but if the aphasic patient likes games it's great.

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

Very important. Interaction is everything. If you can't interact with family and friends, life has no meaning.

3) Could the activity be beneficial? Why / Why not?

Yes. The aphasic player has to think and strategize. If it is difficult at the beginning it will improve. But if it is too difficult, leave it, and try later. You have to gauge their mood and ability.

4) How long do you think the activity should last? Why?

From my experience the attention span lasts only about 15 to 20 minutes. You have to observe and you will know when the attention goes. A 10 minute break can be very useful.

5) Do you have any other comment about the activity?

It is a very good idea.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

It is a very good idea because if they were for example engineers, you could use topics of that field. When I saw your game, I thought it is quite general and could be used by anybody. Some people, however, will enjoy finding that the game is personalized.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

No, I don't think so. Some family members might not have a good relation with the patient.

8) Do you have any other comment about the idea of customization?

I have not seen any other game for aphasics customized, but I think it is a good idea.

About the content

9) If we look at the **complexity** of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

I think every aphasic person will improve. The **simpler example is good for the beginning**. You can **increase complexity when the person improves**. For me the verbs where out of the window at the beginning. The simpler version could have been very good for me during my first year.

10) If we look at the **length** of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

It is **great** to have **different levels of complexity**, but you should **talk to a speech therapist** about this.

11) Do you have any other comment about the content?

The text is very reasonable. There is not complex language in it.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

Aphasic people have their eye sight affected. But **if the board and cards are too big they would feel not properly treated**. The **sizes** of your game are **fine**.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

The size is **good** and I think that it **looks like a real game**. It could be **more interesting** with the **background more colourful**. The **racks are good**.

14) Do you have any other comment about the format?

I think that the **thickness** of the cards **is good**.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

The **second version is better and easier to read**. You should **treat the longer version the same way**.

16) Which of the differences is in your judgement an advantage: lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

The band is very important. People don't want to fail. At the beginning of their recovery their self-esteem is very low. The band helps direct the attention of the player.

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

I think that the grammar should be correct.

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

Extra space between words is good, it facilitates reading. I was having problems with some words, so more space would have helped me to identify better each word.

19) Do you have any other comments about the layout?

The increase in size of punctuation marks, even though it is not that noticeable, is a very good idea, and also the separation of the punctuation marks from the text.

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

You should speak with a dyslexia specialist. I think that lighter colours are better as background and that yellow is the best.

21) Do you believe that colour could help the individual to match question and answer? Why?

I got very mixed up with "wh" words and vowels at the beginning. So colour would help someone like me.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

The softer version is better. The worse colour for background for me is the dark pink.

23) Do you have any other comments about the colour?

I hate the brighter green.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

Not for me, I would look at the colour.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

I don't think so, but for colour blind people it would help.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

Not applicable.

27) Do you have any other comment about the pattern?

I think the patterns are sufficiently different in general, but a couple of cases could be improved.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

I think the simpler one is better, it is easier to read for me.

29) Do you have any other comment about the text?

It is good because it is so similar to my first therapy exercise.

About the project

30) What do you think about this research project?

Fascinating thing, you carry on. I think that games are very important. This is for aphasic people but children can also use it. You have to know I was a teacher and I loved to read aloud. I cannot do that anymore. This game could be used to teach language to children.

31) Do you have any other comment?

You are wonderful. You are doing really well. You could develop this for children and for people learning languages. I was a governor for a school, this could be a very good tool for education.

Interview expert in aphasia 8

Acerca de la actividad

1) ¿Qué opinás de jugar como una actividad para facilitar interacción familiar entre una persona con afasia de Broca y su familia?

The best thing one can do is to rehabilitate playing, using fun, entertaining, creating pleasant situations. The patient doesn't even notice it, and he/she starts rehabilitating. Playing is the ideal means for rehabilitation.

2) ¿Pensás que es una buena idea desarrollar una actividad que la persona con afasia de Broca pueda compartir con su familia? ¿Por qué?

Totally, because it is a way of including the family in the rehabilitation. Otherwise the patient remains very lonely. Often I asked the family: "why don't you tell me what the patient does with the speech therapist?" the family member normally answered: "I don't know, she closes the door." (Said the interviewee, as an example of how the family is excluded from the therapy.) The situation is totally different in melodic therapy, where the family is part of the team.

3) ¿Pensás que esta actividad sería beneficiosa? ¿Por qué?

Yes, of course. The family is essential in the recovery of the patient. To work on the basis of playing is wonderful. Also to work with family, the daily environment and friends.

4) ¿Cuánto tiempo pensás que debería durar? ¿Por qué?

It depends on each patient, and the relation with the activity. I have been sometimes working for two hours with the patient; but a person with aphasia gets disconnected very easily.

5) ¿Tenés otro comentario acerca de la actividad?

The people that participate playing the game must believe it is a benefit. I find resistance to the playing workshops as much from patients as from therapists. For a therapist, to be passionate is important.

Acerca de la idea de personalizar

6) ¿Qué pensás acerca de la idea de personalizar el material para una persona específica? ¿Podría ser un beneficio, o realmente no importa? ¿Por qué?

It is excellent, but very difficult. I think it is very complicated, it is difficult to adapt a game to every aphasic patient. It might be better to develop more generic games for Broca's aphasics, and leave margins for the specialists to use them in different ways.

7) ¿Pensás que tener los nombres de los miembros de la familia es una ventaja? ¿Por qué?

It is perfect, **as long as it could be done easily, it is very interesting.**

8) ¿Tenés otro comentario acerca de la idea de personalizar?

I think that the patient will become **more involved with a game if it is personalized.** It is important to **avoid undesirable characters** that could create conflicts.

Acerca del contenido

9) Si miramos a la **complejidad** del texto, ¿cuál de los dos ejemplos pensás que sería más adecuado para una persona con afasia de Broca? ¿Por qué?

The **shorter** the **better.** The text is **linguistically complex**, but there are aphasic patients that could possibly play with it.

10) Si miramos a la **longitud** del texto, ¿cuál de los dos ejemplos pensás que sería adecuado para una persona con afasia de Broca? ¿Por qué?

The **first version** is **too long.** It could make aphasic **players disoriented, or lost.**

11) ¿Tenés algún otro comentario acerca del contenido?

I think it is too metalinguistic. I also think that the idea is very good. **Different levels of complexity could be created.** The game **could be tested** with several aphasic individuals and see how they respond. It could be useful to evaluate the patients and decide what level of complexity they can use in the game.

Acerca del formato

12) ¿Pensás que el tamaño de las cartas es apropiado y fácil de usar para una persona con afasia de Broca? (lado derecho débil). ¿Por qué?

I think the **size is fine.** I only have **problems with the content.** I would **remove the patterns.**

13) ¿Qué opinás del tamaño de tablero, es apropiado? ¿Pensás que la barra para sostener las cartas es una buena idea? ¿Por qué?

In the case of **bedridden patients the size of the board and the racks should be adapted.**

14) ¿Tenés algún otro comentario acerca del formato?

No further comments.

Acerca del diseño del texto

15) ¿Cuál de las dos opciones pensás que facilitaría más la comprensión del texto?

The second one seems **better.**

16) ¿Cuál de las diferencias es a tu juicio una ventaja: colour más claro; la banda destacando la pregunta; la elección tipográfica; los signos de puntuación más grandes, el texto más corto, el texto agrupado, el uso de dos variables tipográficas en lugar de tres; o todas las opciones nombradas anteriormente? ¿Por qué?

It would be better not to have so many differences in typography. It is good to accentuate the punctuation marks, this will facilitate the recognition of the units of meaning. The most useful feature I think is the light colour band that focuses the attention on the task of the patient. The shorter text in the second version is much better.

17) Si consideramos que la persona padece de agramatismo, ¿sería mejor evitar el uso de los artículos, o es mejor incluirlos en la frase?

It is necessary to offer a proper linguistic model. Articles, prepositions and the like should be included.

18) ¿Pensás que el espacio extra entre palabras, que acentúa las unidades de sentido facilitará la comprensión del texto? ¿Por qué?

No, I don't think so, I think that the typographic arrangement should be as simple as possible.

19) ¿Tenés algún otro comentario acerca del diseño del texto?

I don't think that any aphasic could differentiate between the two different sizes in the second version.

Acerca del colour

20) ¿Pensás que la paleta de coloures es apropiada? ¿Pensás que importa? ¿Por qué?

Yes, they are warm. But, the most important issue is the content, not the colour.

The lighter colours are better.

21) ¿Pensás que el colour podría ayudar a la persona a relacionar la pregunta con la respuesta? ¿Por qué?

One has to be careful. There are patients that try to mask their aphasia and will use any strategy to solve a linguistic problem.

22) ¿Cuál de las dos opciones pensás que funciona mejor, la más clara o la más oscura (saturada)? ¿Por qué?

The lighter one is better because the text is more readable.

23) ¿Tenés algún otro comentario acerca del colour?

I think the colour is fine.

Acerca de la trama

24) ¿Pensás que la trama es adecuada para este juego? ¿Importa? ¿Por qué?

Better to avoid it. The patient should concentrate on the language content.

25) ¿Pensás que la trama puede ayudar a relacionar preguntas y respuestas? ¿Por qué?

If your principal objective is interaction, you should not base your game on Helm-Estabrooks system but use something less grammatical. I would modify the content.

26) ¿Si fueras uno de los jugadores sin afasia, te sería útil la trama? ¿Por qué?

No, because I am not aphasic, and this is designed for people with aphasia.

27) ¿Tenés algún otro comentario acerca de la trama?

No!

Acerca del texto

28) Si fueras uno de los jugadores sin afasia, ¿cuál de los dos ejemplos te sería más fácil de leer?
¿Por qué?

The second because of the better colour and because it is simpler.

29) ¿Tenés otro comentario acerca del texto?

I don't think it is good for a person with aphasia.

Acerca del proyecto

30) ¿Qué pensás de este proyecto?

It is interesting but I think that the game, or rather the content, is too complex for a person with aphasia.

31) ¿Tenés algún otro comentario acerca del proyecto?

The most positive aspect is the work with the family. It is important not to ask the patient to do things that he/she didn't like to do before becoming aphasic (or meet people he didn't like to meet.)

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

B: If they played before it will be good. It should not look like an effort: it should be about playing.

S: For people that used to play board games before it is good.

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

B: I think I could give you examples of what is a bad or a good idea. It would be good for some people and not for others. It is necessary to look at people before the aphasia, if they played before it will be good.

S: It will depend on each person, and on each family.

3) Could the activity be beneficial? Why / Why not?

B: All games like this depend on who is playing it with you. Lots of people I know would be baffled by these games. If this works with Mario is great, but it might not work with others. People with aphasia talk about having an invisible condition, if you don't talk with them you don't notice the impairment.

S: Feeling part of the family could be beneficial.

4) How long do you think the activity should last? Why?

B: It will depend on the players (with aphasia and without).

S: It will probably depend on the players.

5) Do you have any other comment about the activity?

B: No.

S: It is a fantastic idea, games are very good at bringing people together.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

B: It is central to customize. I have not met two people with the same kind of aphasia.

S: If one has the possibility to have the resources it can only be good, we have done it with maps.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

B: Anything that makes it individualized is an advantage. Things that are personalized are very good, they make people feel good.

S: I think in some cases it could be a benefit and motivate the person with aphasia. Mostly if they have a good relation with their families.

8) Do you have any other comment about the idea of customization?

B: I designed the handbook ("The stroke and aphasia handbook," Connect Press. 2004) knowing that everybody will see things differently.

S: No.

About the content

9) If we look at the complexity of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

B: The simpler, the better. People with Broca's aphasia will probably have difficulties with reading. Try to avoid words with similar meaning.

S: Simpler is good, but you would not know without trying.

10) If we look at the length of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

B: I will prefer shorter, at least for the beginning and then you can go to longer texts.

S: Yes, the shorter the better.

11) Do you have any other comment about the content?

S: Using humor is a good idea.

B: Yes, humor is very good.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

B: Yes, the size is good, but the cards should be thicker and probably laminated but not shiny. The cards are a little bigger than the normal cards, and that makes them easy to hold. If they were bigger it would be too much, and would consequently cause some problems.

S: the cards should be thicker, but not that much.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

B: The size is good, it is easy to put on a table. I will suggest that, if it were manufactured it would be better if it were folded.

The racks are a very good idea, so players can have the left hand free, but I would paint the groove so it is easier to see where to put the cards.

S: The size is good, but it could be more interesting, it could be a much brighter colour.

B: It is the place where you can put the "dragons!"

14) Do you have any other comment about the format?

B: About the cards and the board no, but about the tokens, they could be more fun. Their colour disappears a little on the board.

S: Why the token is on the left? I wonder because I am right handed.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

B: The second option is better, but it looks too austere to me. It looks too much like two-colour printing, it means poor. Try to go wild and move back. Try to take it further; you have to take it closer to the look of games.

S: It makes sense to use the band and at the same time increase the size to facilitate reading. You have got the right things here. It is not a baby typeface. There are other typefaces that could be good, but this is good. Maybe making the descenders longer could help.

16) Which of the differences is in your judgement an advantage: lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

B: The second option is better, the size of the type is better, the sensitivity to word space is good, and to separate the punctuation mark a little more from the word is very good. The bands are great. A great divider: subtle but helpful. I wonder about the use of italics, because the last sentence has a different kind of information, it would be better to make a difference.

S: All are advantages, Century has good differentiation between letters, the space between words and lines is better, the band and the bigger size is good; but I also have a problem with the last sentence. The last sentence, "What does he ask?" could be separated. Is it really necessary?

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

B: The grammar should be complete, normal.

S: Yes, I agree (complete).

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

B: Extra space between words can help, but it should be subtle.

S: Space between words is good, but it might vary. In the project I did with Linda Reynolds about children's reading, we found out that children can do well with both wide and normal space, closely spaced words were perceived by the children to be more difficult to read.

19) Do you have any other comments about the layout?

S: The space between lines is good, it is very important.

B: I am a great fan of good space between lines. I think it can help.

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

B: Seven colours would be possible, but twelve different colours are difficult to find. Perhaps you can have groups of content and use one colour per group. The present colours are good, lively, but they are difficult to differentiate.

S: I agree with Bridget about having groups of content and one colour per group. The patterns help, but colour makes the game look like a game.

21) Do you believe that colour could help the individual to match question and answer? Why?

B: I am not sure, they make the game attractive, but I think that the pattern is stronger.

S: Yes, I agree with Bridget.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

B: The softer, because in the other there are some problems with contrast. However, in the second option there are a few colours that are too soft.

S: You have no problem with contrast in the second option.

23) Do you have any other comments about the colour?

B: Yes, don't go to the "cream" way.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

B: I think it is appropriate, it is a non-linguistic element that can help the people with severe aphasia to play. You should line them all up and organize them. I have some doubts about the thick and the thin line, waves could be useful. If the patterns are similar they can be used on different colours.

S: Some are darker than others, I think they should have the same density, and some are more distinct.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

B: I think so, because of the same reason I explained before. It is a very good area to work on. To design 12 patterns; you can do a whole thesis just on this subject. Apart of the issue of the italics, I would leave the typography and concentrate on the patterns.

S: Yes, I agree with Bridget. I think they can help because of the same reason.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

B: I don't think so, I would tend to read. But probably if I am tired, I will use them.

S: Yes, I agree with Bridget.

27) Do you have any other comment about the pattern?

B: I don't think that people would see the patterns as letters, they are different.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

B: The second one; the typeface is better and it works well with this size, the spaces between words and lines are better, so all this makes this option easier to read.

S: You got a better type, better spaces in the second option.

29) Do you have any other comment about the text?

B: Well, again I will use italics in the last sentence.

About the project

30) What do you think about this research project?

B: I am so impressed by your enthusiasm. Bravo for doing this!

S: It is a very good project. You should try to test the game with people with aphasia.

31) Do you have any other comment?

B: It is fantastic for Mario.

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

I don't know. I have avoided family life since I was born. I have no experience with aphasia. But sometimes I forget words, and sometimes whole languages. I live a very isolated life. I spend my time with birds and animals, and books. I am fascinated with language. What happens to people whose abilities to deal with language disappears? Then, my definition of language is as broad as possible. Ravens talk to each other, I see language everywhere. What happens if language is interrupted inside the brain? I never thought of that. What can your stepfather do, can he dance, can he play the piano?

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

As I mentioned, I have avoided family life. But if the problem in this case is social isolation an activity to share could promote family interaction.

3) Could the activity be beneficial? Why / Why not?

I don't know.

4) How long do you think the activity should last? Why?

I don't know about people with aphasia, but how long the game should last probably depends on different factors: cultural, social, personal, etc. There are cultures that spend hours playing, it depends. There are cultures and people that don't like playing at all.

5) Do you have any other comment about the activity?

This is a two way street. This encourages your stepfather to take information and use it.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

Customizing is always a good idea.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

I am an only child. I don't know anything about it. For someone who loves his family is good. For someone who hates family...

8) Do you have any other comment about the idea of customization?

When I am reading a novel like those by Henry James, I stop if the social fabric gets too thick. I would feel claustrophobic, playing games like this, but **if your stepfather likes playing games...**

About the content

9) If we look at the **complexity** of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

I am drawn to the **new ones** (cards), I like the **stripe**, and I like the **different hues** because visually something happens. I am on the other hand, **nervous about the spaces between words**. You mentioned to me they speak in phrases not in words. Of course the space has a grammatical explanation. **Maybe it is a barrier, maybe it is better with no space**. Would it be better to run the words together? I don't know. **It should be tested**, and with no spaces at all. We learn to read with spaces, but for thousands of years they were not used.

10) If we look at the **length** of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

For me the length is not a problem, but for the individual maybe. He needs **short lines**. I would try to do it **like a poem** with very short lines. Like "Odas elementales." The older version requires long steps. One has a positive relation with the experience of a poem. If this were true, the card could be vertical.

11) Do you have any other comment about the content?

I am curious about how **the story ends that gives no room for your stepfather. Where is the room for his intelligence to come out?**

The repeat (i.e. **What did he say?**) sounds too simple and constraining. He **needs opportunities to surprise you**.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

If I lose fine motor control, if I am a clumsy person, I will make a mess. Physical boundaries might be useful. What does your stepfather need to control his movement? Maybe a kind of wall (or corner) will be a more helping thing.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

It looks like a trap (for clumsy people). The token is not easy to put in its place. It could be magnetic.

14) Do you have any other comment about the format?

It looks pretty, but does good typography matter for people with aphasia? You need to test on them the colours, the type. Their preferences may change. Probably the colour and the patterns are more important than the type.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

The spaces contradict what the serifs do. Many people think that Century is good. The aperture is so small, "e", "s." I would look for a typeface that has its clarity, but more openness, "Plantin," "Bembo," "Scala." Maybe that is a good excuse to design a good typeface. The relationship between humans and letters depends on many things. In the 16 century, people in Europe learned to read without learning to write. Reading was not a consuming activity. Printing made the activity consumable. The scribes translated the writing into typography. It is like the difference between a dancer seeing ballet and feeling each movement. We have become spectators. Baskerville, Bembo, Bodoni accentuate the glass (separation); these are unwritten letters. But if you want to return people to language give them a face that they can draw.

16) Which of the differences is in your judgement an advantage: lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

I think this are all advantages. I am suspicious about the apertures, and I like the band. The shorter text is better. I think the extra space between the question mark and the word is a very good idea, like a French style. All North American faces lack this. Except for the enlarged spaces between words, the band sharpens the focus on the question.

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

I don't know.

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

It was answered before.

19) Do you have any other comments about the layout?

I think this band introduces something that is non-linguistic, but is positively coordinated with the structure. This is something restful, it doesn't require me to use a language facility that could cause me trouble. You know, many times I have problems with songs. I don't understand sang language. I like when the singers stop, because I can enjoy the

instruments. The voice could sound nice, but I don't have a clue of what the woman is saying.

The band is perfectly coordinated with the text, I have the suspicion that it is very important in what you are doing. It is like gestures or facial expressions.

I like this banded cards because there is something independent from language but in synchronicity with it.

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

I like these colours, but I don't know about your stepfather. I don't know his colour environment. I have never been in his country. How many shades of orange do you have? How red is an apple? Is he living in a white house? Or tangerine? What is his relation with colour? Has his perception of colour changed?

21) Do you believe that colour could help the individual to match question and answer? Why?

It could, but I wondered if that is what he wants. When I was a child a school student avoided using glasses. If you give them a non-linguistic element, they will use it, but that is not making them use language. If it were designed for children, any child that wants to win will use the colour, but not learn the words, and the intelligent people will become bored. Maybe you should guard yourself against excessive non-linguistic means.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

I don't think it is a problem, it depends on the particular person that is going to use it. If your stepfather likes bright colours, you should use bright colour; if muted, muted. Maybe you should use summer colours in summers, and winter colours in winter, like the Japanese soup that changes according to the seasons. I would like to know if your stepfather listens to the sounds of birds, what animals he can hear. Birds are not only singing, but also communicating. In the island (where Bringham lives) squirrels are talking all the time. This is very restful to me. I wonder how it is for him? I take this is also language. They are delivering messages.

What is going on in this card is similar to an opera. Exaggerated movement across the stage, that is good, you put language in a context that supports it. Then, if you open a book, there are just words, and it is not easy to navigate if you have a problem. In the newspaper, there are many things that have nothing to do with one another. There is chaos, different from opera.

23) Do you have any other comments about the colour?

No comments.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

Well it is fine to me. I think the colour is more important than the pattern. If this is supposed to encourage me to use language, the pattern and the colour will help me to avoid language altogether... So maybe the colours and the patterns should not match.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

Of course, the danger is that probably it helps too much.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

No. If I were colour blind I will be grateful for the pattern, but both colour and pattern help me ignore the language.

27) Do you have any other comment about the pattern?

I like them; it adds visual interest to some degree to the cards.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

The new one, with the softer colours and Century instead of Goudy. Well, Goudy like Centaur and Van Dyke is one of those typefaces that didn't quite succeed making the jump to offset. Loosing the extra weight it can only function in very large sizes. It seems to me that it is overdressed. It wants to be looked at. Century wants to be read, it is a utilitarian typeface. I never used it, but it is very useful.

29) Do you have any other comment about the text?

No further comments about the type. We already talked about it, but I will avoid using italics. I had quite an experience working with native people learning to read in native languages. They found it difficult to make the connection between romans and italics. If you italicize they get perplexed. They say: "what is this? I cannot read it." Your stepfather has experience, but if language has become a problem, my suggestion is to avoid unnecessary variations.

About the project

30) What do you think about this research project?

I will very much like to see how it works. This is designed for someone that I never met. The question is not: does it work for me? but, does it work for your stepfather?

31) Do you have any other comment?

No other comments but a question. Has your stepfather lost touch with written language to the same degree that he lost with spoken language?

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

It is one way of putting people together. As soon as you put things on a table it invites people to focus on a center. A good starting point.

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

Yes. It is different with people with aphasia than with children, with children things may not develop the way you want, but in both cases you may have to adapt the rules to the players. In this case there will be a need to instruct the family.

3) Could the activity be beneficial? Why / Why not?

Yes, you need to force people to get together.

4) How long do you think the activity should last? Why?

It will depend on the users, their skills, energy and capacity to sustain attention.

5) Do you have any other comment about the activity?

I don't know about people with aphasia, but I imagine it is similar in some way to blind people. It requires one to adjust and try to understand a person that thinks and perceives in different ways.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

I think there is not other way. If aphasia cases are unique, it is a must.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

Yes, I think so. Names could also be replaced by pictures.

8) Do you have any other comment about the idea of customization?

I have never done projects customized for specific individuals, but I have done it for specific groups of users.

About the content

9) If we look at the **complexity** of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

I prefer **the simpler one**. One has to **start at the lowest possible level**.

10) If we look at the **length** of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

I prefer **the shorter one**, because of the same reason of **starting at the simpler level**.

11) Do you have any other comment about the content?

No.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

It is practical. I don't think there is a need to hold the cards, you can have them on the table.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

The board is fine as it is, different colours for questions and answers can be used, it is not indispensable but it could help. I don't think the racks are necessary because there is no real need to hide the cards when playing the game.

14) Do you have any other comment about the format?

Not at this point.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

I think **the simpler one** (second option) **is easier to read**.

16) Which of the differences is in your judgement an advantage: lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

I really like the combination of all the elements in the second option. The band makes it visually interesting. Some bright colour could be used, avoiding red and dark green (first option).

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

I have no knowledge to answer.

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

I think the extra separation works but I don't think that micro typography is that important. I think all the other things that you did are very helpful, like the lighter band and the pattern. The extra spaces help but one has to be careful to balance them with letterspacing and line spacing so that everything is consistent.

19) Do you have any other comments about the layout?

I think that the typeface you use is good for the purpose, but is not perfect. This happens all the time. When one has specific needs for a project there is no font that offers everything one needs. I don't think you should try sans serif fonts for this project.

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

As long as the contrast between the type and the background is good, things will work well.

21) Do you believe that colour could help the individual to match question and answer? Why?

Colour is a thing you can use. I think it will help to match questions and answers.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

The softer one, because of the contrast with the text.

23) Do you have any other comments about the colour?

If I were a player and I were lazy I would not use the colour to match questions and answers, but I would use the patterns.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

You can test the patterns and see if patients can use them. Some are easier to distinguish than others.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

I think so, it helps solving the problem without going into language.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

I would maybe use the patterns if I play, just to avoid getting involved with language and looking for typos, grammar, etc.

27) Do you have any other comment about the pattern?

No.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

As soon as you start looking for specific requirements it is difficult to find a font. But I do not know how big of a problem that could be. Type is not a major problem, but what you are doing with the layout in the second option is quite important.

29) Do you have any other comment about the text?

No, there is not other comment.

About the project

30) What do you think about this research project?

As I mentioned in the e-mail the project is very useful, I think that you are working in an area with a lot of needs, where much more work is needed. It will need some thinking about production.

31) Do you have any other comment?

The major problem is to make clear to the family what the game is about. You need to explain what you want to achieve, the need for some breaks, customization, etc. separated from the rules and directed to the family. The instructions can be tested very easily without people with aphasia.

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

It makes sense if the person with aphasia used to play before the stroke.

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

I think it is important, because family interaction is central to the enjoyment of life.

3) Could the activity be beneficial? Why / Why not?

I think it is important because the person with aphasia will not feel alone; and to avoid isolation is important.

4) How long do you think the activity should last? Why?

It will depend on the person, and on the family.

5) Do you have any other comment about the activity?

It should be a pleasure.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

To customize? I think it makes sense, it will increase motivation. The point is how to do it for everybody.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

If one has a good relation with the family; they are the people one loves.

8) Do you have any other comment about the idea of customization?

No.

About the content

9) If we look at the complexity of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

The second option is simpler, but sometimes the question is extremely simple like "When are we eating?" and other times the questions are more complex. Probably they should have all the same level of complexity.

10) If we look at the **length** of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

Probably to start it is **better** if they are **short texts**, but again, I think they should **all** have **the same length**.

11) Do you have any other comment about the content?

Why is the answer a question? You have to forget about the treatment and give priority to the notion of **playing**. There is a need to make a difference between treatments and games. The game should produce **pleasure, enjoyment**. **Satisfaction is fundamental for the human being**. I am thinking like a person without aphasia: for me it is necessary to obtain the patient's faith in the game. For it to function there has to be a promise and it has to be fulfilled. I don't think the content is bad. The treatment was not visual. When one speaks it is different than when one writes. **When one transforms the treatment into something visual and playful, one has to adapt the content**. **The visual aspect is much stronger**. **The content has to be adapted to the visual** and not the other way around.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

The size of the cards is **good**, but perhaps they should be **thicker and harder** so it is **easier** to put them on the rack.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

The size of the board is **good**, but it should be **just one piece** and perhaps **more rigid**, so it is **easier to remove it from the box and put it on the table**.

14) Do you have any other comment about the format?

No.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

The **second option is better**, there is virtue in the typeface, it has been designed **considering legibility**, and it has been used several times in children books. Goudy is a good font, but **Century seems to work better for this specific purpose**.

16) Which of the differences is in your judgment an advantage: lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

I am not sure. **When are the spaces modified? When there are multiple needs.** In signage for example one looks at the morphology of the font, the size and reading speed. It is necessary to open the spacing to help reading speed. **In this case I am not sure.**

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

I don't know. **Intuitively I would use the correct grammar.**

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

I am not sure that the extra space between words will help.

19) Do you have any other comments about the layout?

The text set in Century looks warm.

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

The colour of the background is important in relation to the colour of the text.

21) Do you believe that colour could help the individual to match question and answer? Why?

I think so. In the use of colour and patterns there is an intention of helping the person with aphasia to match the question and answer. A visual code has been designed.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

The lighter colours work better because they **facilitate the perception of the text.**

23) Do you have any other comments about the colour?

I wonder if the answer and the question should not have a different colour, I mean the back side. So you will be helping again the person with aphasia, you will be creating another code.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

The idea is **good**, you are creating a **visual code**.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

I think it helps and it is not childish. It is like having two cards with the same number, they must be related.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

I don't know.

27) Do you have any other comment about the pattern?

No.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

The second one, Century is a friendly font, more than Goudy that shows some conflicts.

29) Do you have any other comment about the text?

No.

About the project

30) What do you think about this research project?

The project is very good. You have done a lot of work.

31) Do you have any other comment?

Not about the project as research, but about the game as a product. The extrapolation of something verbal into something visual requires dramatic interpretation. My perception of your game, that has been increasing as we talk, is that I see it as very ascetic. Among healthy human beings it is necessary to provide stimulation in order to obtain responses. The game needs more drama – as a game it is too austere.

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

Anything that stimulates social interchange is good. I haven't seen that. People are so shattered by what has happened.

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

Certainly, that is essential. Stroke is a disease that affects the whole family.

3) Could the activity be beneficial? Why / Why not?

To have an activity and to be part of a social group is a benefit.

4) How long do you think the activity should last? Why?

It will depend on how tired is the person with aphasia.

5) Do you have any other comment about the activity?

It is very good to involve the family.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

I am interested in what you do because it involves the family. It is very useful to be able to customize it; all aphasia cases are different as people are.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

It is a good idea. Names are very important, they have psychological connotations. One of the most motivating things is to be able to sign again, to recover your own signature.

8) Do you have any other comment about the idea of customization?

Perhaps, you could have blanks in the cards and make the patients write their own names.

About the content

9) If we look at the complexity of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

Try to make questions as simple as possible. For a general public it will be indispensable.

10) If we look at the **length** of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

Try to have **short and simple questions**; **reading can be a very difficult task for someone with aphasia**.

11) Do you have any other comment about the content?

It is **good to have what, who, where, and when**. Possibly other sentences could play more with the distinctions.

I cannot really see the point of **matching a question card to an answer card that has another question**. Surely it would be better to match it to an answer.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

The size is **good**, I think it will be **easy to hold for someone with problems in the right arm**. If they were **thicker** it would be **better**.

It can make the person with aphasia at the same time use the weak arm.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

A bit **smaller** could be good, so it **takes less space on the table**. The racks can be a **challenge, it could cause frustration**.

14) Do you have any other comment about the format?

I wonder about the **decoration in the board**, you could have **more**. **Don't use anything that has no connection** to the actions of the game.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

The **second option seems easier to read to me**, though I like more Goudy than Century, it is more elegant. You have to ask patients, not designers. **Making it easier to read depends on what the patients are used to and like**.

16) Which of the differences is in your judgment an advantage: lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

The new one is much, much better. I do not like the new one, but it is better for the users. More beautiful is not necessarily better.

In the new version, it is good that you avoid italics, and the strip of tone is also good. The simplification of the wording is good.

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

I think it would be better to include them in the sentence.

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

Extra separation will work, particularly for short sentences.

19) Do you have any other comments about the layout?

I would try using Sassoon Sans, Sassoon book will be better. You should look at the thesis of my student about typeface analysis for dyslexic children.

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

You have to have colours, but colours to match are difficult.

21) Do you believe that colour could help the individual to match question and answer? Why?

It would be useful for the physician to use this to see if the patient can distinguish the colours. Does anybody know if colour perception is affected by aphasia?

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

The more soothing colours in the new version are better. They are nicer and have no problems regarding contrast with the text.

23) Do you have any other comments about the colour?

Some of the colours are similar.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

I am not sure that the average person will be able to use the pattern.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

They are beautiful but I am not sure an aphasic patient will be able to distinguish them. They **should be more distinct**.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

I will tend to read.

27) Do you have any other comment about the pattern?

I would like to see them **differentiated as much as possible**. Perhaps, **the patterns could be larger**.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

It is better the **shorter text**. The other would be incomprehensible.

29) Do you have any other comment about the text?

Humour is very good, and **factual things** are also **good**.

About the project

30) What do you think about this research project?

It is a **marvelous concept**. I don't know what the general public will say about this. The public is used to dragons and clutter. They think that illustration is fun. Why are you not using illustrations?

G: In this case I want to focus on language. The use of images would be distracting.

R: I agree. It is good that you have an answer.

31) Do you have any other comment?

The **patterns** should be more distinct and important. The place (the bottom corner) is fine, but they **could be bigger**.

In the second level of difficulty, are there answers? There should be answers, at least for the later stages. But **no question or answer should be confusing**.

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

I think it is a good tool to create interaction. One needs to associate with the person with aphasia to develop an experience of this type.

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

Yes, I think it is important for the person with aphasia to understand the rules of the game. Rules of interaction are at the basis of every social process.

3) Could the activity be beneficial? Why / Why not?

I think it is very hard to live socially isolated, I believe the activity will help to avoid the isolation of the person with aphasia.

4) How long do you think the activity should last? Why?

I don't know, it will depend on the whole group of people playing, and how are they feeling.

5) Do you have any other comment about the activity?

No.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

Yes, I don't know the problem, but something like this game could never be standard. In situations like aphasia it must be personalized because the needs are specific.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

I think it would be a benefit as long as they are members that have a good relation with the person with aphasia. I don't know about aphasia, but it is nice when you go to the bank, or other business and someone calls you by your name, and when it happens the relation changes, one feels more comfortable.

8) Do you have any other comment about the idea of customization?

Many times in design it is necessary to customized a project, you should not be worry about it. We have done it in the studio some times, with "Disco" (famous Argentine supermarket) for example.

About the content

9) If we look at the **complexity** of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

Regarding the situation of someone that could have problems with reading, I would try with simple texts at the beginning, and then the complexity can be increased according to the responses of the users. I think the situation could be similar, like when children are learning to read, or adults are learning to read in a second language, they start to read simple texts and then the level of complexity increases.

10) If we look at the **length** of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

The shorter the better, you are designing a game with cards so the text should be short, it is not the page of a book or a magazine, it is not a test, not a newspaper, it is a game with short texts. Now how short they should be, you will have to test it.

11) Do you have any other comment about the content?

It should be interesting for Mario.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

I think the size is good, they look close to the size of the standard cards. I believe it is positive that the cards look like the cards one is used to play with.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

The size is good, but I would remove the ornaments because they could be distracting and they have no function there. Regarding the racks, again they look like the standard games, and this is positive.

14) Do you have any other comment about the format?

In my opinion the corner of the cards should be round. I would avoid to innovate, it is not by chance that cards have round corners.

The back of the cards should be designed with the same dedication of the front.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

I think that the option with Century Schoolbook is better. Have you tried using Swift? It is a typeface designed by Gerard Unger, it is very simple, clear and neat. Swift was designed for newspapers. It has short ascenders and descenders but this could be fixed.

16) Which of the differences is in your judgment an advantage: lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

I think that typographic selection will have some importance. For example in the case of Mario, if he remembers his past, the type should have serifs. Size is critical because if it is too large reading becomes more difficult. For these players the body should be large, but you have to be careful not to overdo it.

With regards to the size change for the key question it is not that noticeable. Maybe it could be more dramatic, or maybe a colour reversal could be tested. Probably it is not necessary to increase the size of the text, and with the band it is enough. One variable is enough, two can be noisy.

I think it makes sense to have more space between the word and the punctuation mark. We have to think about the way we write, and when writing we always have a space between the last word of the sentence and the punctuation mark.

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

I don't know, but I would believe that it is better to use complete grammar.

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

I think those extra spaces are good. They facilitate word recognition, and in this case it seems to be useful.

19) Do you have any other comments about the layout?

I would test the size of the white frame, I think it could be distracting for the player. I think it is useful, but I wonder if that size is not excessive.

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

One doesn't have 12 possible colours to work with, maximum 7. It is difficult to me to make something joyful and at the same time avoid a childish look. If you use 12 colours, there could be 6 that are lighter and 6 that are darker, such as the differences between pink and red, and yellow and ochre.

21) Do you believe that colour could help the individual to match question and answer? Why?

Maybe the cards could be designed with two colours each card. This would facilitate distinction between them. They could be designed with bands of different sizes.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

The second option is better, but it needs more differentiation in some cases.

23) Do you have any other comments about the colour?

It would be useful to use colours that can be named. One can normally name 7 colours.

I would try to avoid the use of too light colours, they don't help.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

I think they are pertinent. I would not extend them any longer. They are well placed in the colour area. I think it is logical to have them as they are.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

Yes, because I think that they help in case of not being certain about word recognition, but there are a few cases that could be improved, such as the case of the two parallel lines (that in one case one line is thicker). There is one pattern, the one made of circles, that is the only case of irregularity. I think that a similar approach should be taken for all the patterns. That is, if they are regular, they all should be regular. But maybe there could be regular and irregular patterns.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

It depends; probably if I feel tired and I want to play, I will use it.

27) Do you have any other comment about the pattern?

No.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

Everything is better in the second option, the font, the contrast with the background, the band, the spaces between words and lines, all that makes the second text easier to read than the option with Goudy.

29) Do you have any other comment about the text?

What is useful for “normal” people, should be also useful for someone with aphasia. The object should not make the user tired.

About the project

30) What do you think about this research project?

It is very interesting. It is very good that from our field one could enter in other specialized areas that do not know what we can offer.

31) Do you have any other comment?

No.

About the activity

1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?

I think it is a very good excuse. In this kind of problem the important thing is to try to be in the place of the others. In the case of my grandmother the TV is not good, because she is deaf.

2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?

Yes, sure. They want to be integrated with the family, to participate, to be listened to, and if it is possible, to talk. Any kind of link to integrate the family is a social link.

3) Could the activity be beneficial? Why / Why not?

I think so, social interaction is essential for human beings.

4) How long do you think the activity should last? Why?

It will probably depend on how is the person with aphasia this day, and on how fun the game is.

5) Do you have any other comment about the activity?

No.

About the idea of customization

6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?

I think it could be a benefit, I have done similar things as a designer and they work.

7) Do you think that having the names of the family members of the patient is an advantage? Why?

Yes, I think so. You like when someone calls you by your name; this is a similar situation.

It is something designed specially for you.

8) Do you have any other comment about the idea of customization?

Not really.

About the content

9) If we look at the complexity of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?

The second one, it is simpler. The first one seems to be more complicated.

10) If we look at the length of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?

The shorter the text the better it is. I would try to design a clear situation, for example having always three lines for the three different kinds of information. Long lines always create difficulties.

11) Do you have any other comment about the content?

The spaces between words make my reading more difficult because I focus more on the word, instead of on the sentence, but probably in this project this is necessary.

About the format

12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

The size of the cards yes, but probably they could be thicker.

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

In general yes, but there are some components that are small, which at the same time is good because it is better not to create big distances. The racks are complicated.

14) Do you have any other comment about the format?

I find the issue of the token a little complicated, I mean it is complicated that the player doesn't have just to play, but also to count.

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

I would like to have a mix between the two options, the typeface of the second option, with the spaces of the first option.

16) Which of the differences is in your judgement an advantage: lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

The colour is better in the second option, the bigger size in the punctuation marks is difficult to tell, I don't notice it, probably because it is well done. What is annoying is the space between words, it is hard to go from one word to the other. In this project I don't know if it is wrong.

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence?

I am not informed.

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

Yes, for this project, because of the needs of the user.

19) Do you have any other comments about the layout?

The typeface seems to be fine but it has some curvy elements, like the capital "Q" that could be a problem.

I would also try to have more space between the pattern and the last line of text, probably the pattern should be placed at the top of the card. This would facilitate its viewing.

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

The colours seem to be alright, they are joyful but I would keep on working on them. I would not try to have 12 colours but 7 or 6. In order to facilitate recognition as a code, one should be able to name the colours. The colours in the first option are too strong.

21) Do you believe that colour could help the individual to match question and answer? Why?

Yes, if they can be named.

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

The second one, because you have more contrast with the text.

23) Do you have any other comments about the colour?

No.

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

I think so. It should look clearly as a visual cue, it should be more separated from the text, and be as different as possible from the shape of the letters.

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

If they are not similar to the shape of some letters, they could help.

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

I don't think so. I cannot figure out why I will need them.

27) Do you have any other comment about the pattern?

No.

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

I would like a mix: some colours of the second option, with Century and the layout of the first option.

29) Do you have any other comment about the text?

No.

About the project

30) What do you think about this research project?

As a designer I am interested in communication, and as a human being I am interested in preventing people from being isolated. So, I think it is very good.

31) Do you have any other comment?

I think that the idea of using humour is good, but I would avoid confusing and ridiculous situations. "Lucio answers the phone" could be confusing. "Mario is cleaning" is clearer.

Appendix D **Analysis of the expert interviews**

Customization chart

	Customizing a tool	Family names	Other comments
Design expert 5	<p>It makes sense, increases motivation. How to do it for everybody.</p> <p>MOTIVATION HOW TO DO IT FOR EVERYBODY</p>	<p>If one has a good relation.</p> <p>ASSESS RELATIONS</p>	<p>No</p>
Design expert 6	<p>(Good) to involve the family. It is very useful to customize it, aphasia cases are as different as people are.</p> <p>CUSTOMIZATION IS USEFUL DIVERSITY OF CASES</p>	<p>Good idea. Names are important, have psychological connotations. Motivating to be able to sign again.</p> <p>NAMES A GOOD IDEA EMOTIONAL CONNOTATIONS</p>	<p>Have blanks in the cards and make the patients write their own names.</p> <p>BLANKS FOR WRITING</p>
Design expert 7	<p>Something like this could never be standard. Because the needs are specific.</p> <p>NEED FOR CUSTOMIZATION SPECIFIC NEEDS</p>	<p>As long as they are members that have a good relation. I don't know about aphasia, but when someone calls you by your name one feels more comfortable.</p> <p>ASSESS RELATIONS</p>	<p>Many times it is necessary to customize. We have done it.</p> <p>CUSTOMIZATION IS DOABLE</p>
Design expert 8	<p>It could be a benefit.</p> <p>COULD BE BENEFICIAL</p>	<p>Yes Designed specially for...</p> <p>NAMES ARE IMPORTANT DESIGNED SPECIALLY (EMOTIONAL CONNOTATIONS)</p>	<p>No</p>

Customization chart

	Customizing a tool	Family names	Other comments
Design expert 1	<p>It is central. I have not met two people with the same kind of aphasia.</p> <p>CUSTOMIZATION IS IMPORTANT DIVERSITY OF CASES</p>	<p>Individualised is an advantage. Personalised is very good, makes people feel good.</p> <p>AN ADVANTAGE EMOTIONAL CONNOTATIONS</p>	<p>Everybody will see things differently.</p> <p>DIVERSITY</p>
Design expert 2	<p>If one has the resources it can be only good.</p> <p>RESOURCES</p>	<p>It could be a benefit and motivate the person. If they have good relationship with their families.</p> <p>BENEFICIAL – MOTIVATING ASSESS RELATIONS</p>	<p>No</p>
Design expert 3	<p>A good idea.</p> <p>CUSTOMIZATION IS GOOD</p>	<p>For someone who loves his family is good.</p> <p>ASSESS RELATIONS</p>	<p>If your stepfather likes playing games... (and the family idea) it is good.</p> <p>DEPENDS ON THE USER</p>
Design expert 4	<p>There is no other way. If aphasia cases are unique it is a must.</p> <p>NEED FOR CUSTOMIZATION UNIQUENESS OF CASES</p>	<p>Yes. Names could also be replaced by pictures.</p> <p>NAMES ARE IMPORTANT REPLACED BY PICTURES</p>	<p>I have done projects customized for specific groups of users.</p> <p>CUSTOMIZED FOR SPECIFIC GROUPS</p>

Customization chart

	Customizing a tool	Family names	Other comments
Aphasia expert 5	<p>It can be very appealing or too personal. General themes are fine. More appealing if it is a game that everybody can play. An asset.</p> <p>DEPENDS ON THE PERSON GENERAL THEMES AN ADVANTAGE</p>	<p>Tricky. It depends on the relation the patient has with other members.</p> <p>DEPENDS ON THE RELATIONSHIP</p>	<p>No</p>
Aphasia expert 6	<p>It makes sense. More likely to prove beneficial. Wonderful.</p> <p>A BENEFIT</p>	<p>Names are important. Often the names are no longer accessible for verbal expression. If they are stimulated in a game, they may end up more accessible.</p> <p>NAMES ARE IMPORTANT DIFFICULTIES WITH NAMES INCREASE OPPORTUNITIES TO PRACTICE</p>	<p>Humourous aspects relevant. Increases the likelihood that the individual with aphasia will be engaged with the activity.</p> <p>HUMOUR ENGAGING</p>
Aphasia expert 7	<p>Very good idea. The use of topics of interest. The game is quite general, used by anybody. Some people will enjoy it if it is personalised.</p> <p>MOTIVATION / INTEREST) PERSONALISED (ENJOYABLE)</p>	<p>No. Some family members might not have a good relation with the patient.</p> <p>ASSESS RELATIONS</p>	<p>Customized, a good idea.</p> <p>CUSTOMIZATION A GOOD IDEA</p>
Aphasia expert 8	<p>It is excellent, but very difficult. Complicated, difficult to adapt a game to every aphasic patient. ...better to develop more generic games, that the specialists could use in different ways.</p> <p>CUSTOMIZATION A GOOD IDEA HOW TO MAKE IT ADAPTABLE / DIFFICULT BETTER MORE GENERIC</p>	<p>As long as it could be done easily, it is very interesting.</p> <p>HOW TO DO IT EASILY</p>	<p>More involved with a game if it is personalised. Avoid undesirable characters.</p> <p>PERSONALISED (INVOLVING) ASSESS RELATIONS</p>

Customization chart

	Customizing a tool	Family names	Other comments
Aphasia expert 1	<p>Very valuable the idea of names and topics, otherwise there is no interest.</p> <p>MOTIVATION (INTEREST)</p>	<p>An advantage, more opportunities to practice.</p> <p>INCREASES OPPORTUNITIES TO PRACTICE</p>	<p>Nice. There are so many things you can do.</p> <p>OFFERS POSSIBILITIES / ADAPTABLE</p>
Aphasia expert 2	<p>It could be a benefit. Individuals with aphasia vary. Adaptable to others.</p> <p>COULD BE BENEFICIAL DIVERSITY OF CASES HOW TO MAKE IT ADAPTABLE</p>	<p>An advantage, if used carefully. Names of even very close relatives are forgotten. This could cause difficulties.</p> <p>AN ADVANTAGE ASSESS ABILITY TO RECALL / DIFFICULTIES</p>	<p>No</p>
Aphasia expert 3	<p>Good to have subjects that one likes, if one likes the subjects one would be interested and would do the activity. How to do it for everybody.</p> <p>MOTIVATION (INTEREST) HOW TO MAKE IT ADAPTABLE</p>	<p>They are important, easier to remember, emotional connotations.</p> <p>NAMES ARE IMPORTANT EMOTIONAL CONNOTATIONS (NAMES ARE EASY TO REMEMBER)</p>	<p>No</p>
Aphasia expert 4	<p>Good idea. Specific deficits can be appropriately supported through customization.</p> <p>CUSTOMIZATION IS A GOOD IDEA GOOD FOR SUPPORTING SPECIFIC DEFICITS</p>	<p>It makes the game more relevant.</p> <p>RELEVANT</p>	<p>No</p>

Activity chart

	Facilitating family interaction	Sharing with the family	Benefit	Length	Other comments
Design expert 5	If the person used to play before... good.	It is important. Family interaction is central to the enjoyment of life.	It is important, could make the person with aphasia not feel alone, and avoid isolation.	Depends on the person and on the family.	It should be pleasurable.
	DEPENDS ON PERSONAL HISTORY	INTERACTION A LIFE GOAL	AVOID ISOLATION	DEPENDS ON THE PLAYERS	PLEASURABLE
Design expert 6	To stimulate social interchange is good. People are so shattered.	Sharing is essential. Stroke affects the whole family.	To have an activity and be part of a social group is a benefit.	Depends on how tired is the person.	It is very good to involve the family.
	STIMULATING	SHARING IS ESSENTIAL (FOR THE PERSON AND THE FAMILY)	INTERACTION A LIFE GOAL AN ALTERNATIVE TOOL	TIREDFNESS	INVOLVES THE FAMILY
Design expert 7	A good tool to create interaction. Need to associate with the person to develop this tool.	It is important to understand the rules of the game. Rules of interaction are the basis of every social process.	Will help to avoid isolation.	Depends on the whole group, and how are they feeling	No
	AN ALTERNATIVE TOOL PROMOTES INTERACTION	UNDERSTAND RULES	AVOID ISOLATION	DEPENDS ON THE PLAYERS AND THEIR MOOD	
Design expert 8	A very good excuse. Important to try to be in the place of others.	They want to be integrated with the family, to participate... Any kind of link to integrate the family is a social link.	Social interaction is essential for human beings.	Depends on the person with aphasia and how fun the game is.	No
	AN ALTERNATIVE TOOL REQUIRES UNDERSTANDING OF THE OTHER	AN ALTERNATIVE TOOL PROMOTES SOCIAL INTERACTION	INTERACTION A LIFE GOAL	DEPENDS ON THE PERSON DEPENDS ON THE GAME	

Activity chart

	Facilitating family interaction	Sharing with the family	Benefit	Length	Other comments
Design expert 1	<p>If they played before... good. Not an effort: it should be about playing.</p> <p>DEPENDS ON FAMILY HISTORY ENJOYABLE</p>	<p>Good for some people and not for others. Look at people before the aphasia.</p> <p>DEPENDS ON PERSONAL HISTORY</p>	<p>Depends on who is playing. It might not work for all aphasia cases.</p> <p>DEPENDS ON THE PERSON</p>	<p>Depends on the players.</p> <p>DEPENDS ON THE PLAYERS</p>	<p>No</p>
Design expert 2	<p>If they used to play board games before... good.</p> <p>DEPENDS ON PERSONAL HISTORY</p>	<p>Depends on each person and family.</p> <p>DEPENDS ON PERSONAL AND FAMILY HISTORY</p>	<p>Feeling part of the family.</p> <p>INTERACTION A LIFE GOAL</p>	<p>Depends on the players.</p> <p>DEPENDS ON THE PLAYERS</p>	<p>Fantastic idea. Games are very good at bringing people together.</p> <p>FACILITATES FAMILY INTERACTION AN ALTERNATIVE TOOL</p>
Design expert 3	<p>My definition of language is as broad as possible. I see language everywhere.</p> <p>PLAYING, A NON LINGUISTIC COMMUNICATION</p>	<p>An activity to share could promote family interaction.</p> <p>PROMOTES FAMILY INTERACTION</p>	<p>I don't know.</p>	<p>Depends on different factors: cultural, social, personal, etc.</p> <p>DEPENDS ON CULTURAL, SOCIAL AND PERSONAL FACTORS</p>	<p>Encourages to take information and use it.</p> <p>PROMOTES INFORMATION PROCESSING ENCOURAGING</p>
Design expert 4	<p>One way of putting people together. It invites people to focus.</p> <p>FACILITATES FAMILY INTERACTION AN ALTERNATIVE TOOL</p>	<p>Yes. Need to adapt the rules to the players. Need to instruct the family.</p> <p>SHARING IS GOOD ADAPT RULES INSTRUCT THE FAMILY</p>	<p>Need to force people to get together.</p> <p>INTERACTION A LIFE GOAL</p>	<p>Depends on the users, their skills, energy and capacity to sustain attention.</p> <p>DEPENDS ON THE PLAYERS, SKILLS, ENERGY AND ATTENTION SPAN</p>	<p>It requires one to adjust and try to understand a person that thinks and perceives in different ways.</p> <p>REQUIRES UNDERSTANDING OF THE OTHER</p>

Activity chart

	Facilitating family interaction	Sharing with the family	Benefit	Length	Other comments
Aphasia expert 5	A stimulating and social activity. Dutch people like to play games, it is common. Presence of children make playing games a very natural activity. Fun.	Very important. To have social interaction is very hard. A game works.	Social activity will bring the wish to communicate. With games people who had not talked started talking. Language would come out spontaneously.	Depends on the person. They get tired very easily. 15-20 minutes	The idea is great. Adult people with aphasia don't like to play games developed for children.
	PROMOTES SOCIAL INTERACTION CULTURAL CONTEXT - STIMULATING PRESENCE OF CHILDREN - FUN - NATURAL	FACILITATES SOCIAL INTERACTION	PROMOTES THE WISH TO COMMUNICATE, INTERACT AND TALK SPONTANEOUSLY. ENCOURAGING	DEPENDS ON THE PERSON TIREDNESS	AN ALTERNATIVE TOOL A GAME FOR ADULTS
Aphasia expert 6	Great idea!	A new thinking focusing on social interaction and life enhancement. Life Participation Approach to Aphasia. This fits right into it.	It requires individuals with aphasia to process language in a number of different ways; a good language stimulation activity. It requires nonverbal cognitive skills. An opportunity to show some preserved abilities. Good to make them think.	From half an hour to an hour, depending on how stimulating and fun.	A way of trying an alternative to reach language.
	FACILITATES FAMILY INTERACTION	ALIGNED WITH LPAA PROMOTES PARTICIPATION AND MEMBERSHIP	PROMOTES LANGUAGE, THINKING AND PRESERVED ABILITIES. STIMULATING - AN ALTERNATIVE TOOL	DEPENDS ON HOW STIMULATING AND FUN	AN ALTERNATIVE TOOL (TO REACH LANGUAGE)
Aphasia expert 7	If the aphasic patient likes games it is great.	Very important. Interaction is everything. Without interaction life has no meaning.	To think and strategize. If difficult at the beginning it will improve. If too difficult, try later. Gauge mood and ability.	Attention span lasts 15 -20 minutes. Observe, you will know when attention goes. A break can be very useful.	The activity is a very good idea.
	DEPENDS ON PERSONAL HISTORY	SOCIAL INTERACTION A LIFE GOAL	PROMOTES THINKING AND STRATEGIZING. ASSESS MOOD AND ABILITY	ASSESS ATTENTION SPAN	AN ALTERNATIVE TOOL
Aphasia expert 8	The best... is to rehabilitate playing, using fun, entertaining, creating pleasant situations. Playing is the ideal means for rehabilitation.	A way of including the family in the rehabilitation. Otherwise the patient remains very lonely. The family is excluded from the therapy. The family is part of the team.	The family is essential in the recovery of the patient. It is wonderful to work playing, with the family, the daily environment and friends.	Depends on each patient. They get disconnected very easily.	People participating must believe it is a benefit.
	PLAYING IS IDEAL FOR REHABILITATION	FAMILY PART OF THE THERAPY TEAM	FAMILY IS KEY FOR THE RECOVERY PLAYING IS WONDERFUL	DEPENDS ON THE PERSON ATTENTION SPAN	NEED FOR ENTHUSIASM

Activity chart

	Facilitating family interaction	Sharing with the family	Benefit	Length	Other comments
Aphasia expert 1	Good as long as the family had played before. DEPENDS ON FAMILY HISTORY	Very positive. Other ways of interacting. It is good to have structures at home. Rehabilitation lasts only 6 weeks. AN ALTERNATIVE TOOL HEALTH CARE SYSTEM LIMITATIONS SHARING IS POSITIVE	It is beneficial. It structures communication without being goal-oriented. An option for practising communication in a casual and social way. AN ALTERNATIVE TOOL FACILITATES COMMUNICATION	From half an hour to 45 minutes. Playing is a more natural interaction than therapy. NATURAL INTERACTION	The idea of matching symbols and colours is good. Adaptable for therapy. NON LINGUISTIC CUES
Aphasia expert 2	Great idea! Fabulous idea! Playing can help to fulfill one life goal, social interaction. Activities are a very good reason to interact socially, playing can facilitate interaction. SOCIAL INTERACTION A LIFE GOAL FACILITATES FAMILY INTERACTION	Aphasia affects the whole family. Other ways of interacting. Once at home, communication will be limited, causing social connections with others difficult. Psychological consequences: social isolation. Very positive to promote participation. AVOIDS SOCIAL ISOLATION PROMOTES PARTICIPATION	Communication: transaction and interaction. The game fosters both aspects. The social goals of communication are important. PROMOTES TRANSACTION PROMOTES INTERACTION	Depends on the player; individuals with aphasia vary and so does attention span. DEPENDS ON THE PLAYER ATTENTION SPAN	The Life Participation Approach to Aphasia capitalizes on the strengths of the patients: the game is a potential tool to increase participation opportunities. ALIGNED WITH LPAA INCREASES PARTICIPATION
Aphasia expert 3	Very good if the family used to play before. Not many people with aphasia like to play games. DEPENDS ON FAMILY HISTORY	Very good. It is important to play, especially with children. The person could be brought back to the family by playing. PROMOTES FAMILY INTERACTION	Playing for the children is very good, and it is good to have the time with them. The game is good for adults. PRESENCE OF CHILDREN A GAME FOR ADULTS	A limited time is necessary, people with aphasia get very tired. Players must be sensitive to the aphasic, and should be excited about playing. ASSESS TIREDNESS AND EXCITEMENT	Important to have fun playing, could take them out of the depression. FUN AVOID DEPRESSION
Aphasia expert 4	Good if the family used to play before. DEPENDS ON FAMILY HISTORY	Great idea. Another tool to interact. It would be a huge loss if they do not communicate. They will give up if speech does not work. AN ALTERNATIVE TOOL FACILITATES INTERACTION AVOIDS DEPRESSION	It encourages positive communication in the family. ENCOURAGES COMMUNICATION	Depends on the patient. DEPENDS ON THE PATIENT	It is wonderful. AN ALTERNATIVE TOOL

Pattern chart

	Appropriateness of pattern	Pattern to facilitate matching	Usefulness for a non aphasic	Other comments
Design expert 5	<p>The idea is good, you are creating a visual code.</p> <p>CREATES A VISUAL CODE</p>	<p>I think it helps and it is not childish. It is like having two cards with the same number.</p> <p>THE PATTERN FACILITATES MATCHING NOT CHILDISH TWO CARDS WITH THE SAME NUMBER</p>	<p>I don't know.</p> <p>UNCERTAIN</p>	<p>No</p>
Design expert 6	<p>I am not sure that the average person will be able to use them.</p> <p>NOT SURE</p>	<p>I am not sure an aphasic will be able to distinguish them. They should be more distinct.</p> <p>NOT SURE AN APHASIC WILL DISTINGUISH THEY SHOULD BE MORE DISTINCT</p>	<p>I will tend to read.</p> <p>TEND TO READ</p>	<p>Differentiate the patterns as much as possible. They could be larger</p> <p>DIFFERENTIATE THEM MAKE THEM LARGER</p>
Design expert 7	<p>They are pertinent. I would not extend them any longer. They are well placed in the colour area.</p> <p>PERTINENT DO NOT EXTEND THEM WELL PLACED</p>	<p>They help in case of not being certain about word recognition. A few cases could be improved. Maybe there could be regular and irregular patterns.</p> <p>HELP IN CASE OF READING PROBLEMS THEY COULD BE IMPROVED</p>	<p>Probably if I feel tired.</p> <p>IF TIRED</p>	<p>No</p>
Design expert 8	<p>I think so. It should look clearly as a visual cue, be more separated from the text, be as different as possible from the shape of the letters.</p> <p>APPROPRIATE LOOK CLEARLY AS A VISUAL CUE SEPARATE FROM THE TEXT DIFFERENTIATE FROM LETTERS</p>	<p>If they are not similar to the shape of some letters, they could help.</p> <p>IF NOT SIMILAR TO LETTERS</p>	<p>I don't think so.</p> <p>No</p>	<p>No</p>

Pattern chart

	Appropriateness of pattern	Pattern to facilitate matching	Usefulness for a non aphasic	Other comments
Design expert 1	<p>It is appropriate, it is a non-linguistic element that can help people with severe aphasia to play.</p> <p>APPROPRIATE CAN HELP PEOPLE WITH SEVERE APHASIA</p>	<p>It facilitates matching. A very good area to work on. I would leave the typography and concentrate on the pattern.</p> <p>FACILITATES CONCENTRATE ON THE PATTERNS</p>	<p>I would tend to read. If I am tired, I will use them</p> <p>IF TIRED</p>	<p>I don't think that people would see the patterns as letters.</p> <p>PEOPLE WOULD NOT SEE PATTERNS AS LETTERS</p>
Design expert 2	<p>Some are darker than others, they should have the same density, some are more distinct.</p> <p>CHECK PATTERNS' TONE SAME DENSITY SOME ARE EASIER TO DISTINGUISH</p>	<p>I think they can help people with severe aphasia to play.</p> <p>THE PATTERN HELPS</p>	<p>If am tired, I will use them.</p> <p>IF TIRED</p>	<p>No</p>
Design expert 3	<p>Colour is more important than the pattern. The pattern and the colour will help me to avoid language altogether.</p> <p>COLOUR IS MORE IMPORTANT PATTERN AND COLOUR HELP AVOID THE USE OF LANGUAGE</p>	<p>Probably it helps too much.</p> <p>IT HELPS TOO MUCH</p>	<p>If I were colour-blind I will be grateful for the pattern, but both colour and pattern help me ignore the language.</p> <p>COLOUR AND PATTERN HELP IGNORE THE LANGUAGE</p>	<p>I like them</p> <p>NICE</p>
Design expert 4	<p>Test the patterns and see if patients can use them. Some are easier to distinguish than others.</p> <p>TEST THE PATTERN SOME ARE EASIER TO DISTINGUISH</p>	<p>It helps solving the problem without going into language.</p> <p>IT HELPS WITHOUT GOING INTO LANGUAGE</p>	<p>I would use the patterns, to avoid getting involved with language.</p> <p>TO AVOID GETTING INVOLVED WITH LANGUAGE</p>	<p>No</p>

Pattern chart

	Appropriateness of pattern	Pattern to facilitate matching	Usefulness for a non aphasic	Other comments
Aphasia expert 5	Yes. It will be helpful for people that have difficulties reading.	Yes, it will help people to match the right cards without reading.	I don't think the pattern will help people that do not have aphasia. It may be helpful to children. In social interaction between grandchildren and grandparents it can be helpful.	No
	APPROPRIATE HELPFUL FOR READING DIFFICULTIES	IT WILL HELP NO NEED FOR READING	USEFUL FOR CHILDREN	
Aphasia expert 6	Pay attention to the location of the pattern. Left or right? Putting important information on the right might serve a therapeutic purpose of forcing attention to the right side of the space.	The pattern will work well as a cue.	If you realize that you don't need to read the words to do the match, it may be faster simply to concentrate on the patterns.	No
	WATCH LOCATION IT MIGHT SERVE A THERAPEUTIC PURPOSE	WORKS AS A CUE	IT COULD BE FASTER	
Aphasia expert 7	I would look at the colour.	I don't think so, but for colour-blind people it would help.	Not applicable	The patterns are sufficiently different, but a couple of cases could be improved.
	COLOUR IS STRONGER	USEFUL FOR COLOUR-BLIND PEOPLE		SOME ARE EASIER TO DISTINGUISH
Aphasia expert 8	Better to avoid it. The patient should concentrate on the language content.	If your principal objective is interaction... modify the content	No	No
	AVOID IT CONCENTRATE ON LANGUAGE	USEFUL IF THE GOAL IS INTERACTION	No	

Pattern chart

	Appropriateness of pattern	Pattern to facilitate matching	Usefulness for a non aphasic	Other comments
Aphasia expert 1	It can be useful, mostly for colour-blind people.	Yes, but patients will need to be prompted to use it.	No, I will read	It should be optional.
	USEFUL FOR COLOUR-BLIND PEOPLE	IT COULD HELP MATCHING PATIENTS NEED TO BE PROMPTED	No	IT SHOULD BE OPTIONAL
Aphasia expert 2	It depends on what you want to achieve. If you want the person to feel comfortable playing, it is good. If you want them to read, the pattern could be distracting.	The idea is fantastic. Even for me it is useful, but I cannot say it will work in all aphasia individuals. It would be necessary to test it.	It is a great idea; I just look at the corner and I know if it is the right answer.	No
	DEPENDS ON THE GOAL	FANTASTIC / USEFUL CONSIDER APHASIA DIFFERENCES TEST	GREAT IDEA	
Aphasia expert 3	The pattern is good, as long as you do not have to count elements.	The patterns are a good idea, if one has problems understanding one word, one can look at the pattern.	Yes, because of the same reason.	No
	GOOD IF COUNTING IS NOT REQUIRED	GOOD IDEA IF ONE HAS PROBLEMS WITH A WORD	Yes GOOD IDEA IF ONE HAS PROBLEMS WITH A WORD	
Aphasia expert 4	It could be useful with certain people. Particularly with colour-blind people or those that do not pay attention to colour.	Yes, the task is easier. It takes the task out of language and helps cueing.	It is faster; you don't have to read. Probably I wouldn't use it.	No
	USEFUL FOR COLOUR-BLIND PEOPLE	YES / EASIER TAKES THE TASK OUT OF LANGUAGE HELPS CUEING	FASTER NO NEED FOR READING UNCERTAIN USE	

Colour chart

	Appropriateness of colour	Colour to facilitate matching	Softer or brighter colours	Other comments
Design expert 5	<p>The colour of the background is important in relation to the colour of the text.</p> <p>RELATION OF COLOUR TEXT AND BACKGROUND</p>	<p>I think so.</p> <p>COLOUR FACILITATES MATCHING</p>	<p>The lighter colours facilitate the perception of the text.</p> <p>LIGHTER COLOURS</p>	<p>I wonder if the answer and the question should not have a different colour, the back side.</p> <p>DIFFERENT COLOURS FOR QUESTION AND ANSWER BACK OF CARDS</p>
Design expert 6	<p>You have to have colours, but colours to match are difficult.</p> <p>COLOURS TO MATCH / DIFFICULT</p>	<p>It would be useful for the physician to see if the patient can distinguish the colours.</p> <p>USEFUL FOR THE PHYSICIAN</p>	<p>Soothing colours better. They are nicer and have no problems regarding contrast with the text.</p> <p>SOOTHING COLOURS NO PROBLEMS REGARDING CONTRAST</p>	<p>Some of the colours are similar.</p> <p>AVOID COLOUR SIMILARITY</p>
Design expert 7	<p>One doesn't have 12 different colours to work with. It is difficult to me to make something joyful and at the same time avoid a childish look.</p> <p>THERE ARE NOT 12 DIFFERENT COLOURS JOYFUL AND NOT CHILDISH / DIFFICULT</p>	<p>The cards could be designed with two colours per card. This would facilitate the distinction between them.</p> <p>TWO COLOURS PER CARD TO FACILITATE DISTINCTION</p>	<p>The second option is better, it needs more differentiation in some cases.</p> <p>SOFTER COLOURS WATCH SIMILARITIES</p>	<p>It would be useful to use colours that can be named. Avoid the use of too light colours.</p> <p>USE COLOURS THAT CAN BE NAMED AVOID TOO LIGHT COLOURS</p>
Design expert 8	<p>The colours seem to be alright, joyful. Do not try to have 12 colours. To facilitate recognition as a code, one should be able to name the colours. First option too strong.</p> <p>COLOURS ARE ALRIGHT AVOID 12 DIFFERENT COLOURS USE COLOURS THAT CAN BE NAMED</p>	<p>If they can be named.</p> <p>USE COLOURS THAT CAN BE NAMED</p>	<p>The second one, more contrast with the text.</p> <p>SOFTER COLOURS BETTER CONTRAST</p>	<p>No</p>

Colour chart

	Appropriateness of colour	Colour to facilitate matching	Softer or brighter colours	Other comments
Design expert 1	Twelve different colours are difficult to find. You could have groups of content and use one colour per group. The present colours are good, lively.	Colours make the game attractive, but the pattern is stronger.	The softer, in the other there are problems with contrast.	Don't go to the cream.
	TWELVE DIFFERENT COLOURS/DIFFICULT USE COLOUR PER GROUPS THE PRESENT COLOURS ARE GOOD	THE PATTERN IS STRONGER	SOFTER	DON'T USE CREAM COLOURS
Design expert 2	You could have groups of content and use one colour per group. Colour make the game look like a game.	The pattern is stronger.	There are no problems with contrast in the second option.	No
	USE COLOUR PER GROUPS LOOK OF GAMES	THE PATTERN IS STRONGER	SOFTER	
Design expert 3	I like these colours, but I don't know about your stepfather. What is his relation with colour? Has his perception of colour changed?	It could, but I wondered if that is what he wants. That is not making him use language. Guard yourself against excessive non-linguistic means.	It depends on the person that is going to use it. This card is like an opera, you put language in a context that supports it.	No
	CONSIDER THE USER'S REACTIONS TO COLOUR	CONSIDER USER'S WANTS COLOUR HELP AVOID USE OF LANGUAGE REDUCE NONS-LINGUISTIC MEANS	CONSIDER USER'S PREFERENCES THE DESIGN SUPPORTS LANGUAGE	
Design expert 4	As long as the contrast between the type and the background is good, things will work well.	It will help.	The softer one, because of the contrast with the text.	If I were a player and I were lazy I would use the patterns.
	GOOD CONTRAST BETWEEN TYPE AND BACKGROUND	COLOUR FACILITATES MATCHING	SOFTER BETTER CONTRAST	PATTERN FACILITATES MATCHING (BETTER THAN COLOUR)

Colour chart

	Appropriateness of colour	Colour to facilitate matching	Softer or brighter colours	Other comments
Aphasia expert 5	It is important, it makes the cards nice, and helps one find the answer. Ensure enough contrast. COLOUR MAKES THE CARDS NICE, HELPS FIND THE ANSWER. CHECK CONTRAST	Yes, it makes the tasks a lot easier. COLOUR FACILITATES MATCHING	For the first level the softer version is better, for the difficult level the first version with brighter colours is better. FIRST LEVEL SOFTER VERSION DIFFICULT LEVEL BRIGHTER COLOURS	People specialised in dyslexia might know more about how colours can facilitate reading. CONSULT PEOPLE SPECIALISED IN DYSLLEXIA
Aphasia expert 6	It is good, beautiful. It doesn't look childish. BEAUTIFUL NOT CHILDISH	Yes COLOUR FACILITATES MATCHING	The softer one. It increases the contrast between the text and background. SOFTER MORE CONTRAST	The overall colour design is very attractive and pleasing. It looks "adult," unlike many therapy materials that are currently available for people with language difficulties. ATTRACTIVE AND PLEASING LOOKS ADULT
Aphasia expert 7	Speak with a dyslexia specialist. Lighter colours are better as background, yellow is the best. CONSULT DYSLLEXIA SPECIALIST LIGHTER COLOURS YELLOW IS THE BEST	... very mixed up with "wh" words and vowels at the beginning. Colour would help. "WH" WORDS AND VOWELS DIFFICULTIES COLOUR FACILITATES MATCHING	The softer one. It increases the contrast between the background and the text. SOFTER MORE CONTRAST	I hate the brighter green. AVOID BRIGHTER GREEN
Aphasia expert 8	Yes, they are warm. The lighter colours are better. WARM LIGHTER BETTER	Yes, it is a simpler task than reading. Be careful. Patients try to mask their aphasia and will use any strategy to solve a linguistic problem. PATIENTS MASK THEIR APHASIA COLOUR WILL FACILITATE MATCHING SIMPLER TASK THAN READING	The lighter is better, the text is more readable. LIGHTER MORE READABLE	The colour is fine. FINE

Colour chart

	Appropriateness of colour	Colour to facilitate matching	Softer or brighter colours	Other comments
Aphasia expert 1	It is appropriate. The colours make the game look like a game. APPROPRIATE LOOK OF GAMES	Sure, it takes language out of it, and the task becomes a simpler task than reading. COLOUR COULD HELP MATCHING THE TASK BECOMES SIMPLER	The softer palette, it is more contrasting with the text. SOFTER PALETTE BETTER MORE CONTRAST WITH THE TEXT	Colour will not make or break the success of this game. GAME'S SUCCESS DOES NOT ONLY DEPEND ON COLOUR
Aphasia expert 2	It is lovely; it is appropriate for an adult, not childish. The red in the old version was not a good idea, it is hard to look at. APPROPRIATE FOR AN ADULT RED HARD TO LOOK AT	I cannot say it will help to match questions and answers, sometimes the differences are too subtle. Individuals will differ. You will have to test it. UNCERTAIN DIFFERENCES ARE SUBTLE TEST IT	In the softer one the text is easier to recognize and the colours are not disturbing. SOFTER PALETTE BETTER TEXT EASIER TO RECOGNIZE NOT DISTURBING	No
Aphasia expert 3	The colours are attractive, but not important. It is easier to use the patterns than the colours. ATTRACTIVE NOT IMPORTANT EASIER TO USE THE PATTERNS	If they were all the same colour, it will be harder to play. You cannot say it in general because there are different forms of aphasia. SAME COLOUR HARDER TO PLAY TOO MANY DIFFERENT APHASIAS	The softer colours are nicer, the others are too strong. SOFTER NICER	No
Aphasia expert 4	A medium tone will be better, not too bright, not too saturated. Colours help the game look like a game. MEDIUM TONE BETTER LOOK OF GAMES	Yes, it is a simpler task than reading. COLOUR WILL FACILITATE MATCHING SIMPLER TASK THAN READING	The lighter colours in the new game are better (second option). It has a better contrast. LIGHTER COLOURS BETTER CONTRAST	Some patients are not so aware about colour. Colour makes the game more attractive. Your new high pitch colours are more pleasant to the eye. COLOUR MAKES THE GAME ATTRACTIVE NEW COLOURS MORE PLEASANT

Layout chart

	The two arrangements of the text	Advantages	Use of articles	Word separation	Other comments
Design expert 5	<p>Second option is better, the typeface has been designed considering legibility, used several times in children books. Century works for this purpose.</p> <p>SECOND OPTION CENTURY WORKS</p>	<p>When are the spaces modified? When there are multiple needs. In this case I am not sure.</p> <p>NOT SURE ABOUT WORD SPACE</p>	<p>Intuitively I would use the correct grammar.</p> <p>CORRECT GRAMMAR</p>	<p>I am not sure.</p> <p>NOT SURE</p>	<p>The text set in Century looks warm.</p> <p>CENTURY WARM</p>
Design expert 6	<p>Second option seems easier to read. Ask patients. Making it easier to read depends on what the patients are used to and like.</p> <p>SECOND OPTION ASK PATIENTS WHAT PATIENTS ARE USE TO AND LIKE</p>	<p>In the new version, it is good that you avoid italics, the strip of tone is also good. The simplification of the wording is good.</p> <p>AVOID ITALICS BAND AND SHORTER TEXT</p>	<p>Include them in the sentence.</p> <p>INCLUDE ARTICLES</p>	<p>Extra separation will work, particularly for short sentences.</p> <p>WORK FOR SHORT SENTENCES</p>	<p>"x type" will work better. Look at the thesis of... about typeface analysis for dyslexic children.</p> <p>"X TYPE" BOOK WILL WORK</p>
Design expert 7	<p>Century Schoolbook is better. Try using Swift.</p> <p>SECOND OPTION TRY SWIFT</p>	<p>Typographic selection will have some importance. Size is critical. The size change for the key question is not noticeable. One variable is enough. Extra space makes sense.</p> <p>TYPEFACE AND SIZE ARE IMPORTANT ONE VARIABLE IS ENOUGH EXTRA SPACE MAKE SENSE</p>	<p>I would believe that it is better complete grammar.</p> <p>COMPLETE GRAMMAR</p>	<p>Those extra spaces are good. They facilitate word recognition.</p> <p>FACILITATES WORD RECOGNITION</p>	<p>Test the size of the white frame.</p> <p>WHITE FRAME</p>
Design expert 8	<p>A mix between the two options, the typeface of the second one, with the spaces of the first one.</p> <p>THE TYPEFACE OF THE SECOND ONE, THE SPACES OF THE FIRST ONE</p>	<p>The colour is better in the second option, bigger size in the punctuation probably is well done. Spaces between words (make) hard to go from one word to the other.</p> <p>COLOUR PROBABLY PUNCTUATION WORD SPACE HARD TO READ</p>	<p>Not informed.</p>	<p>Yes, for this project, because of the needs of the user.</p> <p>WORD SPACE HELPS</p>	<p>The typeface has some curvy elements that could be a problem. More space between the pattern and the text. The pattern should be at the top.</p> <p>TYPEFACE COULD BE A PROBLEM PATTERN AT THE TOP</p>

Layout chart

	The two arrangements of the text	Advantages	Use of articles	Word separation	Other comments
Design expert 1	Second option is better, but it looks too austere. Bring it closer to the look of games. SECOND OPTION BRING IT CLOSER TO GAMES	Second option better, size, word space, to separate the punctuation mark. The bands are great. Last sentence different information. SIZE, WORD SPACE, SPACE/PUNCTUATION MARK, BAND LAST SENTENCE DIFFERENT INFORMATION	Grammar should be complete, normal. COMPLETE GRAMMAR	Extra space between words can help, but it should be subtle. EXTRA SPACE CAN HELP SUBTLE	Space between lines is good, it is very important. LINE SPACE GOOD
Design expert 2	Makes sense to use the band and increase the size to facilitate reading. The typeface is good. Making the descenders longer could help. BAND / BIGGER SIZE FACILITATES READING TYPEFACE IS GOOD	Century has good differentiation between letters, space between words and lines is better, band and bigger size is good. Last sentence could be separated. TYPEFACE, WORD AND LINE SPACES, BAND, BIGGER SIZE SEPARATE LAST SENTENCE	Grammar should be complete. COMPLETE GRAMMAR	Space between words is good. ...we found out that..., closely spaced words were... more difficult to read. SPACE BETWEEN WORDS IS GOOD CLOSELY SPACED WORDS DIFFICULT TO READ	Good space between lines can help. GOOD LINE SPACING CAN HELP
Design expert 3	The spaces contradict what the serifs do. I would look for a typeface that has Century's clarity, but more openness, "Plantin," "Bembo," "Scala." Give them a typeface that they can draw. SPACES CONTRADICTORY A TYPEFACE WITH BETTER APERTURE A TYPEFACE THAT THEY CAN DRAW	... all advantages. I am suspicious about the apertures, I like the band. The shorter text is better. The extra space between the question mark and the word is a very good idea. APERTURES PROBLEMATIC BAND, SHORTER TEXT, EXTRA SPACE IN THE PUNCTUATION MARK (ADVANTAGES)	I don't know.	Answered before. SPACES CONTRADICTORY	The band introduces something that is non-linguistic. The band is perfectly coordinated with the text, I have a suspicion that it is very important in what you are doing. THE BAND IS IMPORTANT
Design expert 4	The second option is easier to read. SECOND OPTION	The band makes it visually interesting. Some bright colour could be used, avoiding red and dark green. BAND BRIGHT COLOUR COULD BE USED	I have no knowledge to answer.	The extra separation works, but micro typography is not important. ... be careful to balance them... so that everything is consistent. EXTRA SPACE WORKS, BUT IS NOT IMPORTANT SPACE'S CONSISTENCY	The typeface is good for the purpose, but is not perfect. When one has specific needs for a project there is no font that offers everything one needs. TYPEFACE IS GOOD, NOT PERFECT WHEN SPECIFIC NEEDS, NO FONT OFFERS EVERYTHING

Layout chart

	The two arrangements of the text	Advantages	Use of articles	Word separation	Other comments
Aphasia expert 5	Second option is better, looks easier to read.	People with aphasia do not generally spell, but they recognize the word profile, so I believe that the extra separation of words is good. In the second option the type is nicer, clearer.	Leave them in. As normal as possible. The language should be correct.	Yes	The second option is easier to read.
	SECOND OPTION EASIER TO READ	EXTRA SEPARATION OF WORDS TYPEFACE (CENTURY SCHOOLBOOK)	LANGUAGE SHOULD BE CORRECT	WILL HELP COMPREHENSION	SECOND OPTION EASIER TO READ
Aphasia expert 6	The game is focused on matching, so in this sense the differences between the layouts don't create that much of a difference. The band of light colour is useful at the beginning level, it could disappear after to increase the difficulty of the task.	The band makes the individual focus on that area.	Keep the text fully grammatical: do not omit short words. Written text that purposely omitted functor words would be even harder to comprehend.	Word separation is not crucial. The difficult task for people with alexia and aphasia is figuring out meaning, not the visual perception component of reading.	No.
	THE GAME FOCUSES ON MATCHING LAYOUTS DON'T CREATE DIFFERENCES BAND COULD DISAPPEAR IN SECOND LEVEL	BAND	TEXT FULLY GRAMMATICAL (IF NOT) HARDER TO COMPREHEND	WORD SEPARATION IS NOT CRUCIAL THE DIFFICULT TASK IS FIGURING OUT MEANING	
Aphasia expert 7	Second version better and easier to read. Treat the longer version the same way.	The band is very important. People don't want to fail. At the beginning their self-esteem is very low. The band helps direct the attention of the player.	The grammar should be correct.	Extra space facilitates reading. More space would have helped me to identify better each word.	The increase in size of the punctuation marks is a very good idea, also the separation of the punctuation marks from the text.
	SECOND OPTION LONGER VERSION SAME WAY.	BAND SELF-ESTEEM IS VERY LOW	CORRECT GRAMMAR	EXTRA SPACE HELP	SIZE OF PUNCTUATION MARKS AND THEIR SEPARATION FROM THE TEXT GOOD IDEA
Aphasia expert 8	The second better.	Not to have many differences in typography. Good to accentuate punctuation marks, facilitates the recognition of the units of meaning. The most useful feature is the light colour band. Shorter text much better.	It is necessary to offer a proper linguistic model.	No, I don't think so.	I don't think that any aphasic could differentiate between the two different sizes in the second version.
	SECOND OPTION	NOT MANY DIFFERENCES IN TYPOGRAPHY PUNCTUATION MARKS BAND / SHORTER TEXT	PROPER LINGUISTIC MODEL	WILL NOT HELP	NO APHASIC COULD DIFFERENTIATE BETWEEN THE TWO SIZES

Layout chart

	The two arrangements of the text	Advantages	Use of articles	Word separation	Other comments
Aphasia expert 1	I like the extra spaces in the new approach.	The band is very good. The shorter text is an advantage. Lighter colours, it is easier to read...	Have a complete grammar. To remove the articles will be insulting.	It is easier to read for me, I don't think it will help the individual's comprehension.	No
	EXTRA SPACES NEW APPROACH (SECOND OPTION)	BAND SHORTER TEXT LIGHTER COLOURS	COMPLETE GRAMMAR (IF NOT) INSULTING	EASIER TO READ WILL NOT HELP COMPREHENSION	
Aphasia expert 2	I like the spaces and the font in the new approach	The emphasis in the punctuation marks is very good. Some people would have visual impairments... it is good to visually facilitate the recognition of the end of the sentence. The band is a non-linguistic element that can facilitate the identification of a key sentence.	The grammar should be always complete, ...omit short words, the text could be even harder to read.	It seems easier to read to me. The problem of people with reading impairments is not to recognize the words, but to comprehend them.	No
	SPACES AND FONT NEW APPROACH (SECOND OPTION)	PUNCTUATION MARK BAND	COMPLETE GRAMMAR (IF NOT) HARDER TO READ	EASIER TO READ WILL NOT HELP COMPREHENSION	
Aphasia expert 3	The second option is easier to read. The distance between words makes it easier to read, it should be always the same distance. Text with normal space is very difficult to read.	The lighter colour in the band and the larger size are very important. You can see the most important thing first. Colour is important in this case. Don't explain it from the beginning.	The grammar should be complete.	I think so. Words with "normal" distance are more difficult to read.	It looks very nice as it is.
	SECOND OPTION WORD SPACE	BAND LARGER SIZE COLOUR	COMPLETE GRAMMAR	WILL HELP COMPREHENSION	NICE
Aphasia expert 4	I like the second option. To consider: a special enlarged version available. Many geriatric people have visual problems.	The colour band and chunked text are... an advantage. More distinct colours would be helpful. The type seems clearer in the new option.	The grammar should be appropriate. Simple but correct.	I like it, I don't have a research basis for my answer. We do that naturally when we write our own cards.	Good... use of lowercase letters, all in capitals would be harder to read.
	SECOND OPTION CONSIDER ENLARGED VERSION	COLOUR BAND CHUNKED TEXT MORE DISTINCT COLOURS / TYPEFACE	SIMPLE BUT CORRECT GRAMMAR	NO RESEARCH BASIS WE DO IT WHEN WRITING	CAPITALS HARDER TO READ

Format chart

	Cards	Board and racks	Other comments
Design expert 5	<p>The size of the cards is good, perhaps they should be thicker and harder, so it is easier to put them on the rack.</p> <p>GOOD THICKER AND HARDER</p>	<p>The size of the cards is good. The board could be just one piece and more rigid, so is easier to remove it from the box and put it on the table.</p> <p>GOOD ONE PIECE MORE RIGID</p>	<p>No</p>
Design expert 6	<p>The size is good, easy to hold for someone with problems in the right arm. Thicker would be better. It can make the person with aphasia use the weak arm.</p> <p>GOOD, EASY TO HOLD THICKER USE OF THE RIGHT ARM</p>	<p>Smaller could be good, so it takes less space on the table. The racks can be a challenge and cause frustration.</p> <p>SMALLER, IN RELATION TO (TABLE) RACKS FRUSTRATING</p>	<p>More decoration on the board. Don't use anything that has no connection.</p> <p>MORE DECORATION</p>
Design expert 7	<p>The size is good, close to the size of the standard cards. Positive that the cards look like usual playing cards.</p> <p>GOOD IN RELATION TO (STANDARD CARDS) THE LOOK IS POSITIVE</p>	<p>The size is good, the ornaments could be distracting and they have no function there. The racks look like the standard games, this is positive.</p> <p>GOOD ORNAMENTS DISTRACTING RACKS POSITIVE</p>	<p>The corner of the cards should be round. The back of the cards should be designed with the same dedication of the front.</p> <p>ROUND CORNER BACK OF THE CARDS</p>
Design expert 8	<p>The size is good, they could be thicker.</p> <p>GOOD THICKER</p>	<p>In general good, Better not to create big distances. The racks are complicated.</p> <p>GOOD AVOID BIG DISTANCES RACKS COMPLICATED</p>	<p>The token is a little complicated, the player doesn't have just to play but also count.</p> <p>COUNTING COMPLICATED</p>

Format chart

	Cards	Board and racks	Other comments
Design expert 1	<p>The size is good. The cards should be thicker, laminated but not shiny. Easy to hold. Bigger could cause problems.</p> <p>GOOD THICKER, LAMINATED, NOT SHINY. EASY TO HOLD</p>	<p>Good, easy to put on a table. It should be better if it were folded. It is the place where to put the "dragons."</p> <p>GOOD IN RELATION TO BETTER FOLDED / MORE DECORATION RACKS GOOD IDEA. PAINT THE GROOVE</p>	<p>Tokens could be more fun. Their colour disappear a little on the board.</p> <p>TOKENS MORE FUN WATCH CONTRAST</p>
Design expert 2	<p>Should be thicker.</p> <p>THICKER</p>	<p>The size is good, could be more interesting, a much brighter colour.</p> <p>SIZE GOOD MORE INTERESTING BRIGHTER</p>	<p>Why the token is on the left?</p>
Design expert 3	<p>If I am a clumsy person, I will make a mess. Physical boundaries might be useful. A kind of wall (or corner) will be more helpful.</p> <p>PHYSICAL BOUNDARIES</p>	<p>It looks like a trap (for a clumsy person). The token could be magnetic.</p> <p>A TRAP MAGNETIC TOKEN</p>	<p>It looks pretty. You need to test on them the colours, the type.</p> <p>PRETTY TEST IT</p>
Design expert 4	<p>It is practical. I don't think there is a need to hold the cards, have them on the table.</p> <p>PRACTICAL</p>	<p>The board is fine. Different colours for questions and answers could help. No real need to hide the cards when playing the game.</p> <p>FINE QUESTIONS AND ANSWER DIFFERENT COLOURS RACKS NO NEED</p>	<p>No</p>

Format chart

	Cards	Board and racks	Other comments
Aphasia expert 5	<p>Ok, cards are big enough. Too big could be cumbersome. The material should last and be able to be cleaned.</p> <p>BIG ENOUGH. TOO BIG CUMBERSOME. CONSIDER MATERIAL</p>	<p>Good. Bigger could be a problem for the usual size of tables. The racks are good.</p> <p>GOOD IN RELATION TO RACKS GOOD</p>	<p>Comfortable to look at.</p> <p>COMFORTABLE TO LOOK AT</p>
Aphasia expert 6	<p>Good. Attractive.</p> <p>GOOD ATTRACTIVE</p>	<p>Excellent to have card holders. The groove could be wider so that the cards sit back easier.</p> <p>EXCELLENT CARD HOLDERS GROOVE WIDER</p>	<p>You could use a card holder instead of a rack.</p> <p>CONSIDER THE USE OF A CARD HOLDER</p>
Aphasia expert 7	<p>If the board and cards are too big they would feel not properly treated. The sizes are fine.</p> <p>BIGGER SIZE/NOT PROPERLY TREATED FINE</p>	<p>Good, it looks like a real game. It could be more interesting, the background more colourful. The racks are good.</p> <p>GOOD, LIKE A REAL GAME BACKGROUND MORE COLOURFUL RACKS GOOD</p>	<p>The thickness of the cards is good.</p> <p>GOOD THICKNESS</p>
Aphasia expert 8	<p>The size is fine. I would remove the patterns.</p> <p>FINE</p>	<p>For bedridden patients the size of the board and the racks should be adapted.</p> <p>BEDRIDDEN PATIENTS</p>	<p>No</p>

Format chart

	Cards	Board and racks	Other comments
Aphasia expert 1	Good, in relation to the hand. GOOD IN RELATION TO	Good, on this table. Clean board, if something doesn't have a function don't use it. The racks are very good. GOOD IN RELATION TO FREE OF ORNAMENTS	No
Aphasia expert 2	The size of the cards is appropriate. They are light and easy to move. APPROPRIATE GOOD IN RELATION TO LIGHT AND EASY TO MOVE	The size of the board is appropriate. Good in relation to tables. The racks are a good idea, the material is light and easy to handle. APPROPRIATE GOOD IN RELATION TO RACKS GOOD IDEA	No
Aphasia expert 3	The size of the cards is good The most important thing is to understand the rules. The cards are very nice. GOOD AND NICE	The size of the board is good. It can be more attractive, it is so simple. The idea of the racks is good, they can be nicer. GOOD. MORE ATTRACTIVE RACKS GOOD. NICER	The tokens are too simple, it must be more exciting to advance the tokens. Introduce tasks to perform while moving the token. TOKENS TOO SIMPLE
Aphasia expert 4	A good size. Bigger than usual playing cards. I like the white frame, helps people with visual field deficits. GOOD SIZE WHITE FRAME HELP	The size of the board is good in relation to the cards and the movements one has to do on it. Easy to use. The racks are a good, players can have both hands free. GOOD IN RELATION TO EASY TO USE RACKS GOOD	Brain injured patients might find ornaments too distracting. Patterns on the board can be confusing. ORNAMENTS TOO DISTRACTING PATTERNS CONFUSING

Content chart

	Customizing a tool	Family names	Other comments
Design expert 5	<p>The second is simpler, sometimes extremely simple, others more complex.</p> <p>Have all at the same level of complexity.</p> <p>SIMPLER SAME COMPLEXITY</p>	<p>To start it is better short texts, all the same length.</p> <p>SHORT TEXT SAME LENGTH</p>	<p>Difference between treatments and games. Satisfaction is fundamental. Transform the treatment into something visual and playful.</p> <p>DIFFERENCES BETWEEN TREATMENT AND GAME VISUAL AND PLAYFUL</p>
Design expert 6	<p>Make the question as simple as possible.</p> <p>AS SIMPLE AS POSSIBLE</p>	<p>Short and simple questions; reading can be difficult for someone with aphasia.</p> <p>SHORT AND SIMPLE READING A DIFFICULT TASK</p>	<p>Good to have what, who, where and when. I cannot see the point of matching a question card to an answer card that has another question.</p> <p>GOOD WH INTERROGATIVE THE ANSWER IS A QUESTION</p>
Design expert 7	<p>Simple texts at the beginning, then the complexity can be increased according to the user.</p> <p>SIMPLE TEXT (INCREASE LEVEL) DIFFERENT LEVELS</p>	<p>The shorter the better.</p> <p>A game with cards so the text should be short. Test it.</p> <p>SHORTER TEST IT</p>	<p>It should be interesting for...</p> <p>INTERESTING FOR (MOTIVATING)</p>
Design expert 8	<p>The second one, simpler.</p> <p>The first one, more complicated.</p> <p>SECOND SIMPLER FIRST COMPLICATED</p>	<p>Shorter better.</p> <p>Design a clear situation, always three lines, three different kinds of information. Long lines always create difficulties.</p> <p>SHORTER SAME SITUATION AVOID LONG LINES</p>	<p>Spaces between words... reading more difficult... focus on the word. Probably this is necessary.</p> <p>WORD SPACE (FOCUS ON THE WORD) NECESSARY</p>

Content chart

	Complexity	Length	Other comments
Design expert 1	The simpler, the better. Difficulties with reading. Avoid words with similar meaning.	Shorter for the beginning then longer texts.	Humour is a good idea.
	SIMPLE DIFFICULTIES WITH READING AVOID SIMILAR MEANING	SHORTER, THEN LONGER	HUMOUR
Design expert 2	Simpler is good, you would not know without trying.	The shorter the better.	Humour is very good.
	SIMPLE TESTING	SHORTER	HUMOUR
Design expert 3	New ones, (because of) stripe, different hues. Nervous about the spaces between words. It should be tested	Short lines like a poem.	The story end gives no room for your stepfa- ther, ...for his intelligence. Need (for) opportunities to surprise.
	NEW ONE (SHORTER) TESTING	SHORT LINES	ROOM FOR INTELLIGENCE NEED FOR OPPORTUNITIES
Design expert 4	The simpler one. Start at the lowest possible level.	The shorter one. Starting at the simpler level.	No
	SIMPLER LOWEST LEVEL	SHORTER SIMPLE LEVEL	

Content chart

	Complexity	Length	Other comments
Aphasia expert 5	<p>Use both options building up the level of difficulty.</p> <p>Longer texts could be introduced with non-linguistic aids and then removed. The challenge has to be there.</p> <p>LEVEL OF DIFFICULTY NON-LINGUISTIC AIDS NEED FOR CHALLENGE</p>	<p>You could have both.</p> <p>The 3rd and 4th level could have answers.</p> <p>TO HAVE ANSWERS</p>	<p>It would be nice to play 4 levels of difficulty.</p> <p>LEVELS OF DIFFICULTY</p>
Aphasia expert 6	<p>The task centers on matching.</p> <p>Another level... reading comprehension.</p> <p>Linguistic complexity is more important than formal complexity.</p> <p>LEVEL OF TASK DIFFICULTY LINGUISTIC COMPLEXITY MORE IMPORTANT</p>	<p>The length is alright (for matching).</p> <p>If the task were to require reading comprehension... need to provide more context.</p> <p>READING COMPREHENSION (NEED FOR MORE CONTEXT)</p>	<p>More cognitive and linguistically challenging if it required decoding of the text for meaning, rather than matching visual information.</p> <p>MORE COGNITIVE AND LINGUISTICALLY CHALLENGING</p>
Aphasia expert 7	<p>Simple good for the beginning.</p> <p>Increase complexity when the person improves.</p> <p>SIMPLER DIFFERENT LEVELS OF COMPLEXITY</p>	<p>Great to have different levels of difficulty.</p> <p>You should talk with a speech therapist.</p> <p>DIFFERENT LEVELS OF COMPLEXITY</p>	<p>The text is very reasonable.</p> <p>REASONABLE COMPLEXITY</p>
Aphasia expert 8	<p>Shorter, better.</p> <p>It is linguistically complex.</p> <p>SHORTER LINGUISTICALLY COMPLEX</p>	<p>The first version is too long.</p> <p>It could make aphasic players disoriented, or lost.</p> <p>TOO LONG DISORIENTATION</p>	<p>Different levels of complexity could be created.</p> <p>The game could be tested.</p> <p>DIFFERENT LEVELS OF COMPLEXITY TESTING</p>

Content chart

	Complexity	Length	Other comments
Aphasia expert 1	<p>Simpler text better. It makes the patient feel comfortable with the task. You can have a second level of difficulty.</p> <p>SIMPLE COMFORTABLE LEVEL OF DIFFICULTY</p>	<p>Start with the shorter version and then increase the length. Help the person avoid feeling frustrated.</p> <p>SHORTER VERSION AVOID FRUSTRATION</p>	<p>It will be valuable to use functional phrases. It will be good if they are specific and practical for that person.</p> <p>FUNCTIONAL PHRASES</p>
Aphasia expert 2	<p>The new system. The reading impairment will differ.... To start with a simple sentence, to facilitate familiarity with the text.</p> <p>NEW SYSTEM READING IMPAIRMENT DIFFERENCES START SIMPLE/FACILITATE FAMILIARITY</p>	<p>The reading impairment will differ from person to person. Start with simple and short words and sentences.</p> <p>READING IMPAIRMENT DIFFERENCES SIMPLE AND SHORT</p>	<p>Reading aloud is a good idea.</p> <p>READING ALOUD</p>
Aphasia expert 3	<p>Even the second option is hard for someone with severe aphasia, difficult to read. Difficult but ok.</p> <p>HARD FOR SEVERE APHASIA DIFFICULT TO READ DIFFICULT IS OK</p>	<p>Good two different lengths, one easier. Different levels of difficulty. It means that more people can play the game.</p> <p>DIFFERENT LENGTHS DIFFERENT LEVELS</p>	<p>By learning the game you learn the logic of the game. It is important to understand the question. This could bring the person with aphasia to think.</p> <p>LEARNING UNDERSTANDING THINKING</p>
Aphasia expert 4	<p>Good to have more than one level, depending on the patient you can use one level or the other.</p> <p>DIFFERENT LEVELS DEPENDING ON THE DAMAGE</p>	<p>Good to start with a shorter version, some pa- tients have trouble organizing their thoughts. Different levels allow you to use the game for a longer term.</p> <p>START WITH A SHORT VERSION TROUBLE ORGANIZING THOUGHT DIFFERENT LEVELS</p>	<p>It would be good to treat apraxia.</p> <p>TREAT APRAXIA</p>

Text chart

	Reading / Player without aphasia	Other comments
Aphasia expert 1	<p>New version is easier to read because of the band.</p> <p>NEW VERSION BAND</p>	No
Aphasia expert 2	<p>The second option is easier to read, the words are easier to see, the lines are not too close.</p> <p>SECOND OPTION WORD AND LINE SPACES</p>	<p>It is beautiful.</p> <p>BEAUTIFUL</p>
Aphasia expert 3	<p>The second option is easier to read, probably because of the space between words, or the letters that are bigger.</p> <p>SECOND OPTION WORD SPACES / SIZE</p>	<p>It is very good to use humour. It is good to have the person with aphasia laugh about something.</p> <p>HUMOUR AND LAUGHING</p>
Aphasia expert 4	<p>The new option is easier to read. The text is clearer, it looks bigger; the colour is softer. It is aesthetically pleasant.</p> <p>NEW OPTION CLEARER / BIGGER / SOFTER COLOUR PLEASANT</p>	<p>I like the fact that it is prompting questions. Sometimes the patients say short sentences but do not ask questions</p> <p>PROMPTING QUESTIONS</p>

Text chart

	Reading / Player without aphasia	Other comments
Aphasia expert 5	The second option is easier to read, the text is clear, bigger	It looks nice.
	SECOND OPTION CLEAR / BIGGER	NICE
Aphasia expert 6	The new approach is more readable.	No
	NEW APPROACH	
Aphasia expert 7	The simpler one is better, it is easier to read.	Good...similar to...
	SECOND OPTION SIMPLER	GOOD (CONTENT)
Aphasia expert 8	The second option has better colour and it is simpler.	I don't think it is good for a person with aphasia.
	SECOND OPTION COLOUR / SIMPLER	NOT GOOD (CONTENT)

Text chart

	Reading / Player without aphasia	Other comments
Design expert 1	<p>The second one; the typeface is better and it works well with this size, the spaces between words and lines are better, ...this option is easier to read.</p> <p>SECOND OPTION TYPE / SIZE / WORD AND LINE SPACES EASIER TO READ</p>	<p>I will use italics in the last sentence.</p> <p>USE ITALICS IN THE LAST SENTENCE</p>
Design expert 2	<p>You got a better type, better spaces in the second option.</p> <p>TYPE / SPACES SECOND OPTION</p>	No
Design expert 3	<p>The new one, with the softer colours and Century instead of Goudy. Goudy wants to be looked at. Century wants to be read, it is a utilitarian typeface.</p> <p>NEW COLOURS / CENTURY</p>	<p>Avoid using italics.</p> <p>Native people found difficult to make the connection between roman and italics.</p> <p>Avoid unnecessary variations.</p> <p>AVOID ITALICS AVOID UNNECESSARY VARIATIONS</p>
Design expert 4	<p>As soon as you start looking for specific requirements it is difficult to find a font.</p> <p>Type is not a major problem, what you are doing with the layout in the second option is quite important.</p> <p>DIFFICULT TO FIND A FONT FOR SPECIFIC REQUIREMENTS THE LAYOUT IN THE SECOND OPTION</p>	No

Text chart

	Reading / Player without aphasia	Other comments
Design expert 5	<p>The second one, Century is a friendly font.</p> <p>SECOND ONE CENTURY</p>	No
Design expert 6	<p>It is better the shorter text.</p> <p>SHORTER TEXT</p>	<p>Humour is very good, and factual things are also very good.</p> <p>HUMOUR AND FACTUAL THINGS GOOD</p>
Design expert 7	<p>Everything is better in the second option, the font, the contrast with the background, the band, the spaces between words and lines. The second text is easier to read</p> <p>SECOND OPTION FONT / CONTRAST / BAND / SPACES EASIER TO READ</p>	<p>What is useful for 'normal' people, should be also useful for someone with aphasia. The object should not make the user tired.</p> <p>USEFUL FOR NORMAL PEOPLE, USEFUL FOR APHASIA DO NOT MAKE THE USER TIRED</p>
Design expert 8	<p>I would like a mix: some colours of the second option, with Century and the layout of the first option.</p> <p>A MIX</p>	No

Project chart

	About this research project	Other comments
Aphasia expert 1	<p>Sometimes people with someone with aphasia in the family get to know something about the problem. You did not only learn about aphasia.</p> <p>NOT ONLY LEARNED ABOUT APHASIA</p>	<p>This is more than just visual communication.</p> <p>MORE THAN VISUAL COMMUNICATION</p>
Aphasia expert 2	<p>This is not about therapy, but it could be adapted, and it is very good for interaction. I like your idea a lot: participation and social approach. Well thought through.</p> <p>GOOD FOR INTERACTION GOOD IDEA PARTICIPATION AND SOCIAL APPROACH</p>	<p>Other games could explore "closure tasks." This could be used to develop confidence in the individual.</p> <p>The back of the cards should not be too complicated.</p> <p>CLOSURE TASKS COULD BE USED TO DEVELOP CONFIDENCE BACK OF THE CARDS</p>
Aphasia expert 3	<p>It is good for people with aphasia to play games with the family, and there are no games for them.</p> <p>Go step by step and allow the person with aphasia to find the solution.</p> <p>GOOD TO PLAY / NO GAMES FOR PEOPLE WITH APHASIA ALLOW THE PERSON TO FIND THE SOLUTION</p>	<p>It could be good not to explain the issue of the colour and the pattern. It would be good for the aphasic person to discover things.</p> <p>DO NOT EXPLAIN PATTERN AND COLOUR DISCOVER THINGS</p>
Aphasia expert 4	<p>Great idea</p> <p>GREAT IDEA</p>	<p>No</p>

Project chart

	About this research project	Other comments
Aphasia expert 5	<p>Very good idea. It could have actual answers.</p> <p>VERY GOOD IDEA ACTUAL ANSWERS</p>	<p>The colours could be more colourful but not bright. The pattern on the back of the cards makes them look like regular playing cards.</p> <p>MORE COLOURFUL PATTERN ON THE BACK GOOD</p>
Aphasia expert 6	<p>Good for patients because it forces them to learn to meet the goals, take turns, and develop matching skills. It would be useful to create another level were the tasks were more complex than matching, and required more complex linguistic and cognitive abilities.</p> <p>If patients with aphasia use games in therapy they are usually children's games. There are no games designed for people with aphasia. Computer games do not foster interaction.</p> <p>FORCES TO LEARN TO MEET THE GOALS, TAKE TURNS, AND DEVELOP MATCHING SKILLS ANOTHER LEVEL COULD REQUIRE MORE LINGUISTIC AND COGNITIVE ABILITIES USUALLY CHILDREN'S GAMES COMPUTER GAMES DO NOT FOSTER INTERACTION.</p>	<p>It would be useful to create a game where patients have to respond to a question... having to select a card from several possibilities. This game could easily be adapted to rehabilitation.</p> <p>Sometimes the best therapeutic ideas come from the loved ones of our patients, the ones who experienced firsthand the devastation that aphasia can produce.</p> <p>USEFUL TO RESPOND TO A QUESTION AND SELECT FROM POSSIBILITIES ADAPTED TO REHABILITATION THE PATIENTS LOVED ONES, EXPERIENCE FIRSTHAND THE DEVASTATION</p>
Aphasia expert 7	<p>Fascinating thing; you carry on.</p> <p>FASCINATING</p>	<p>This could be a very good tool for education</p> <p>GOOD TOOL FOR EDUCATION</p>
Aphasia expert 8	<p>It is interesting but the content is too complex for a person with aphasia.</p> <p>INTERESTING TOO COMPLEX</p>	<p>The most positive aspect is the work with the family.</p> <p>Do not ask the patient to do things that he/she didn't like to do before.</p> <p>POSITIVE THE WORK WITH THE FAMILY DO NOT ASK TO DO NEW THINGS</p>

Project chart

	About this research project	Other comments
Design expert 1	<p>Impressed by your enthusiasm. Bravo for doing this!</p> <p>ENTHUSIASM BRAVO</p>	<p>It is fantastic for your stepfather.</p> <p>FANTASTIC FOR YOUR STEPFATHER</p>
Design expert 2	<p>It is a very good project</p> <p>VERY GOOD</p>	<p>No</p>
Design expert 3	<p>I will very much like to see how it works.</p> <p>SEE HOW IT WORKS</p>	<p>Not applicable</p>
Design expert 4	<p>The project is very useful, you are working in an area with a lot of needs, where much more work is needed. It will need some thinking about production.</p> <p>VERY USEFUL AN AREA WITH A LOT OF NEEDS PLAN PRODUCTION</p>	<p>The major problem is to make clear to the family what the game is about. You need to explain what you want to achieve, separated from the rules and directed to the family.</p> <p>MAKE THE GOAL CLEAR</p>

Project chart

	About this research project	Other comments
Design expert 5	No	It is necessary to provide stimulation in order to obtain responses. The game needs more drama – as a game it is too austere.
		PROVIDE STIMULATION IN ORDER TO OBTAIN RESPONSES NEEDS MORE DRAMA
Design expert 6	Marvelous concept.	The patterns could be bigger. No question or answer should be confusing.
	MARVELOUS CONCEPT	AVOID CONFUSIONS
Design expert 7	Very interesting. It is good that from our field one could enter in other specialised areas that do not know what we can offer.	No
	INTERESTING GOOD TO ENTER IN SPECIALISED AREAS	
Design expert 8	It is very good.	The idea of humour is good, avoid confusing and ridiculous situations.
	VERY GOOD	AVOID CONFUSING AND RIDICULOUS SITUATIONS

Appendix E **Layout design**

Appendix E Layout design Goudy prototype 1st level

Carolina sees that Gustavo has
turned on the TV, so she asks,
What are you watching?
What does Carolina ask?

Roberto and Vella have been hiking,
and Roberto gets tired.
Vella asks other tourists,
Where is the bus stop?
What does Vella ask?

Mercedes asks Mario to help
cleaning the house because
they are having company. Mario asks,
Who is coming?
What does Mario ask?

.....

Paula and German are on a long flight.
After many hours, Paula asks,
When are we landing?
What does Paula ask?

.....

Appendix E Layout design Goudy prototype 1st level

Agustina is in the kitchen
baking a chocolate cake.

Lucio comes and asks her.

What are you doing?

What does Lucio ask?



Mario wants to read the newspaper,
but he cannot find his glasses.

He asks Mercedes:

Where are my glasses?

What does Mario ask?

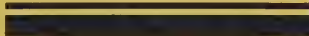


Gustavo is preparing a big BBQ.

Agustina, surprised, asks him,

Who is coming to visit?

What does Agustina ask?



Agustina is talking with Mario
about her birthday party, and

Mario asks her:


When is the party?

What does Mario ask?




Appendix E Layout design Goudy prototype 1st level


When I see Agus sitting
at her word processor, I say,
What are you writing?
What do I say?




Mario is going to the park for a walk.
A neighbour runs into him and asks,
Where are you going?
What does he ask?



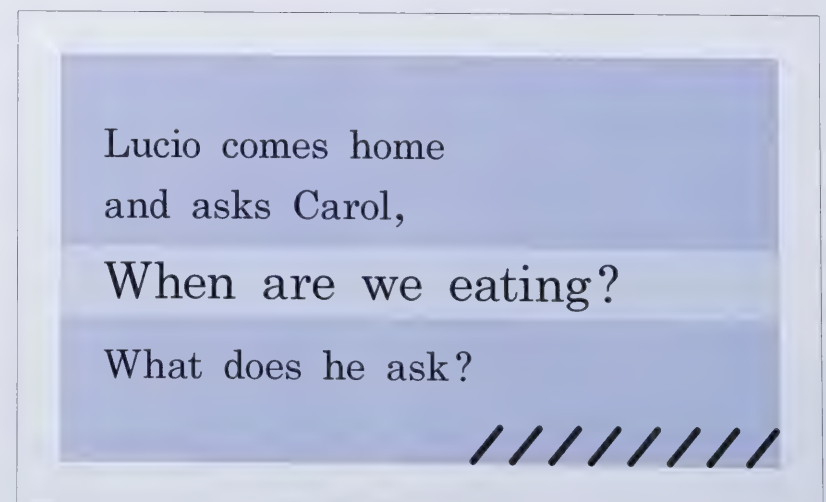
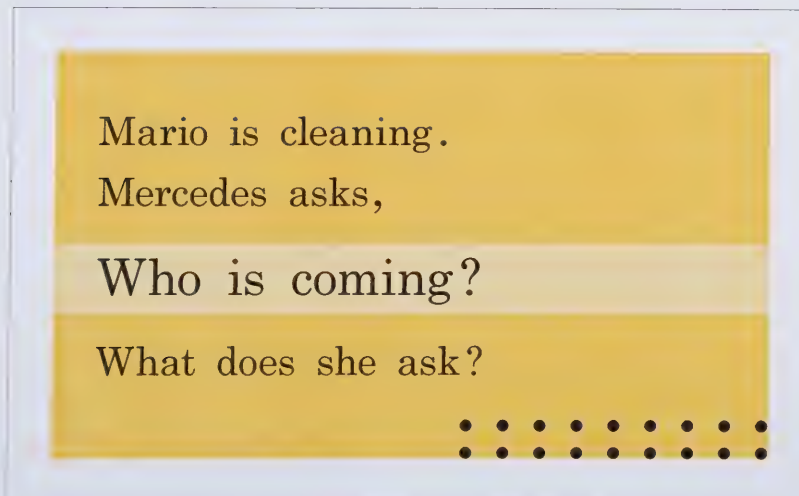
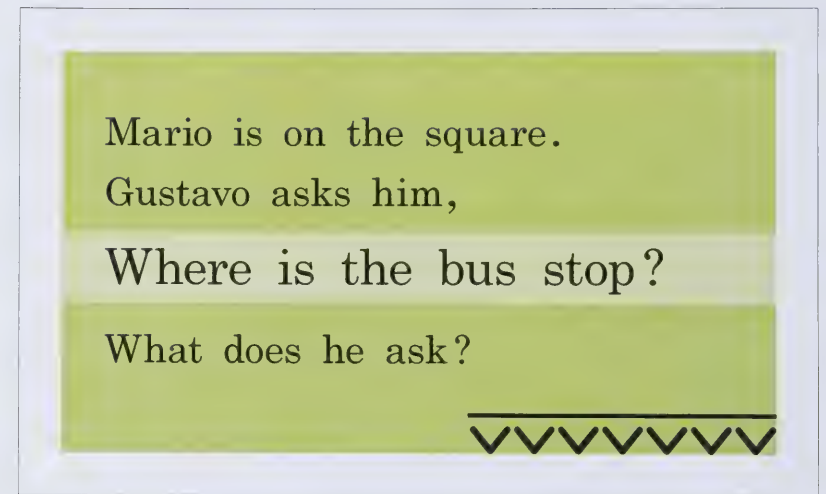
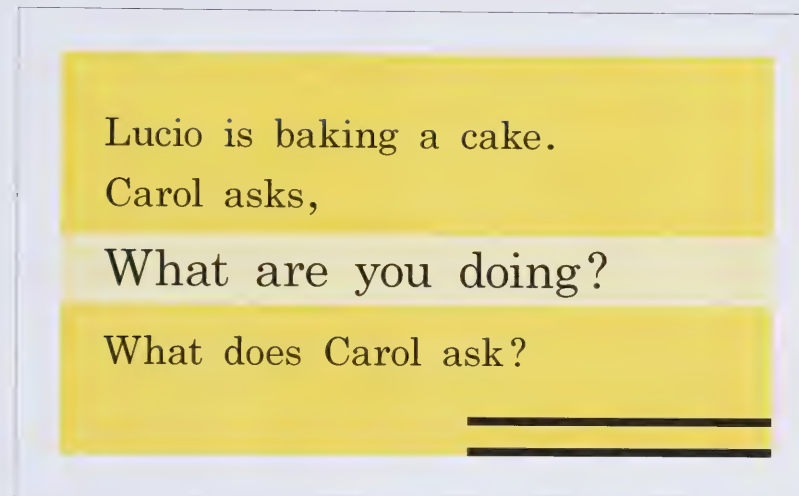
Mercedes answered the phone,
after talking for some minutes,
Mario asks,
Who is calling?
What does Mario ask?



Carolina called Mario to announce
that this afternoon she is coming
with the children. Mario asks,
When are you coming?
What does Mario ask?



Appendix E Layout design Century prototype 1st level



Appendix E Layout design Century prototype 1st level

Mario is watching TV.
 Lucio asks him,
 What are you watching?
 What does he ask?



Mario is biking to the park.
 Agus asks him,
 Where are you going?
 What does she ask?



Lucio answered the phone.
 Agus asks,
 Who is calling?
 What does he ask?



Guille asks Mario,
 When are you coming?
 What does she ask?



Appendix E Layout design Century prototype 1st level

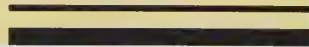
Mario is eating.
 Mercedes asks him,
 What are you eating?
 What does Mercedes ask?



Agus is reading,
 and asks Carol,
 Where are my glasses?
 What does she ask?



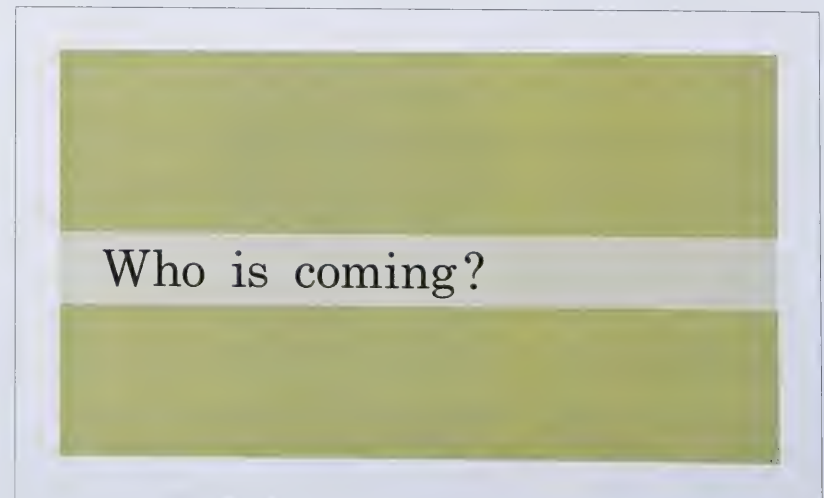
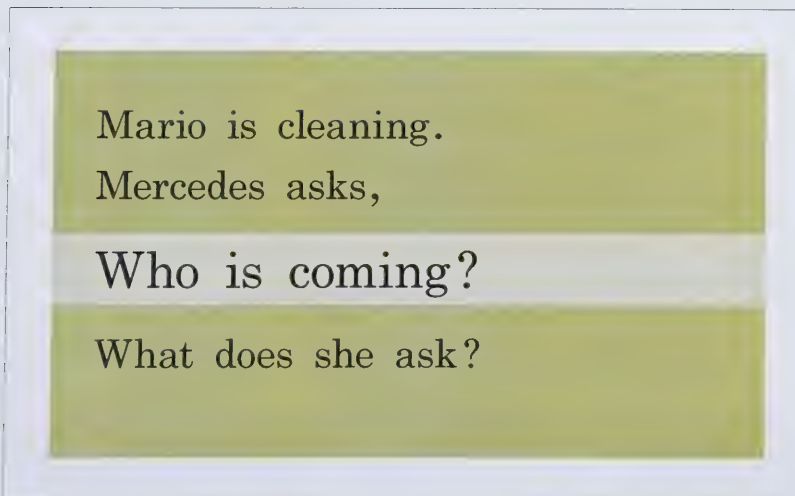
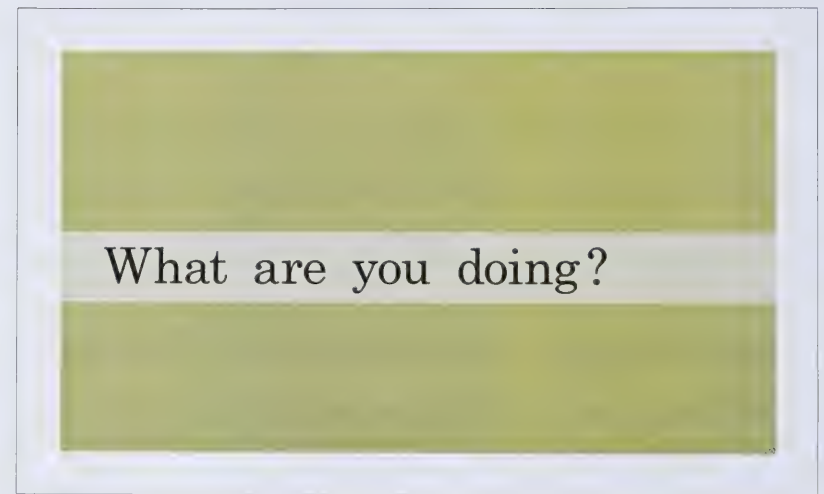
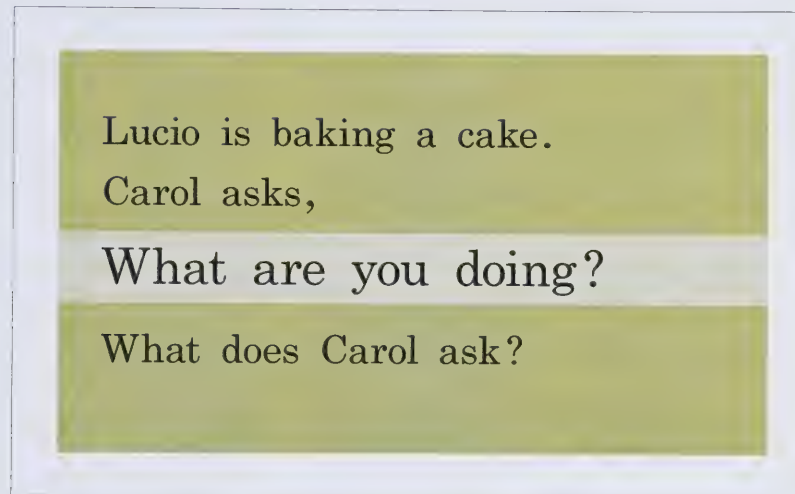
Agus and Mario are going to
 the cinema. He asks,
 Who is acting?
 What does he ask?



Jorge is talking with Mario,
 and asks:
 When is the game?
 What does he ask?



Appendix E Layout design Century prototype 2nd level



Appendix E Layout design Century prototype 2nd level

Mario is on the square.

Gustavo asks him,

Where is the bus stop?

What does he ask ?

Where is the bus stop?

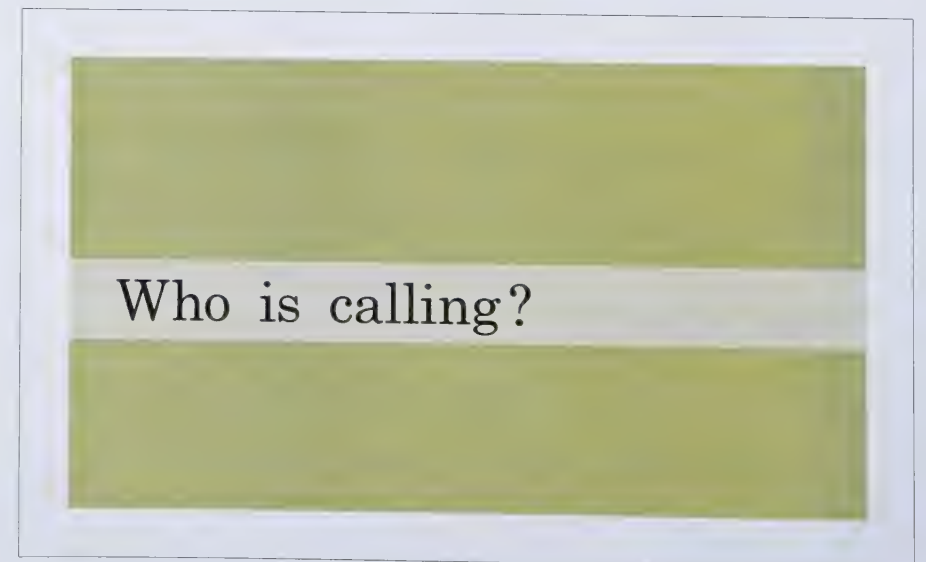
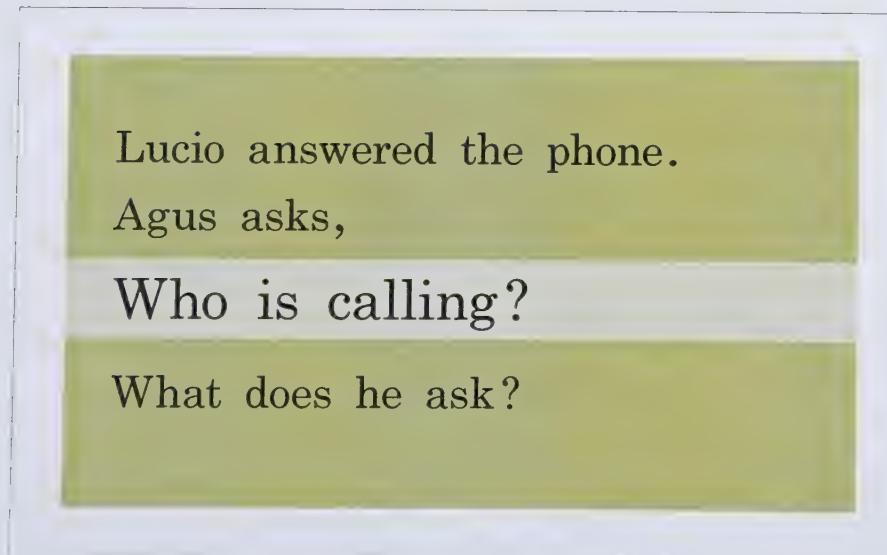
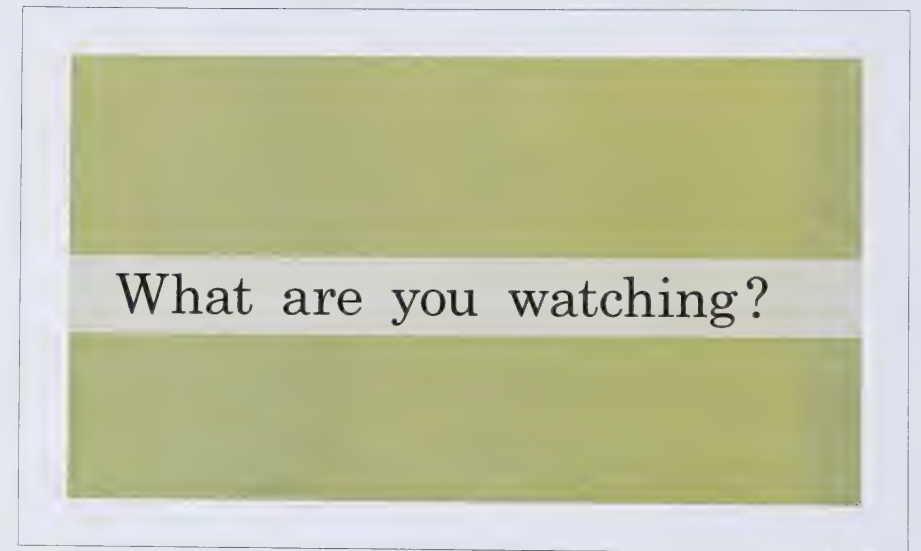
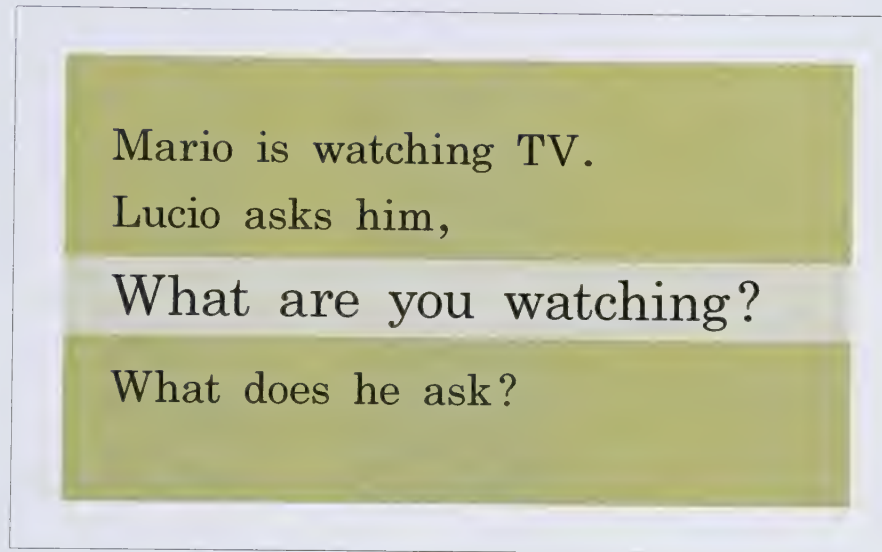
Lucio comes home
and asks Carol,

When are we eating?

What does he ask ?

When are we eating?

Appendix E Layout design Century prototype 2nd level



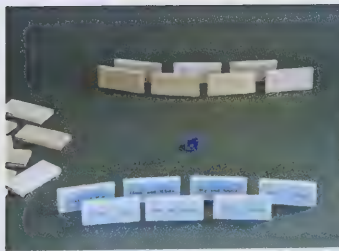
Appendix F **Pairing domino and matching card games**

Pairing dominoes

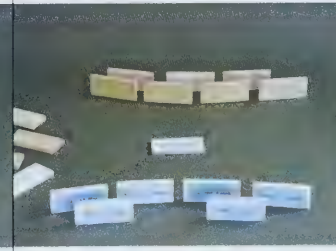
English version

A customized game designed for AM to play with his family. The aim is to combine opposite pairs of words.

Pairing domino has 8 complete pairs of words, 36 pieces and a die.

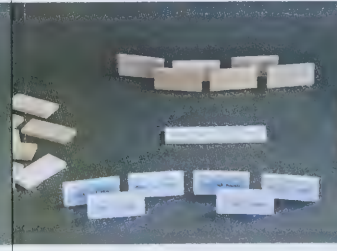


To start,
each player takes 7 tiles and rolls the die.

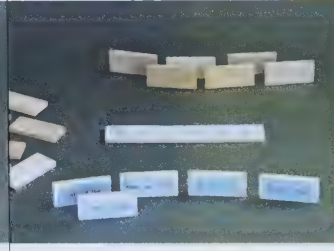


The player with the highest number places on the table any tile that has a complete pair of words (for example: salt and pepper).

If the player does not have any complete pair, another tile is taken from the group of unused tiles. If it is a complete pair it is placed on the table, otherwise it is the next player's turn.



The next player has to look for a word to complete the pair. It means any tile containing the word 'salt' or 'pepper.'



A line of dominoes is formed on the table by completing the pairs of words on the tiles.

The player that first gets rid of all the tiles on hand wins.

To get the score, all the tiles on hand are added up, each tile is 5 points.

Matching card

English version

The game has 4 groups of cards, based on 4 topics that AM likes. The words are high frequency words for AM.

In the English version the groups are: cars, european soccer teams, classical musicians, and international politicians.

The aim is to match categories of cards.

The game can be played by 2 or 4 players.



Politicians



Cars



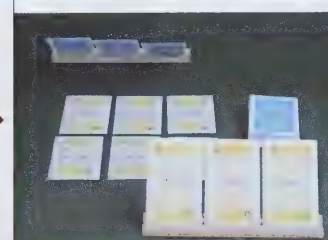
Soccer teams



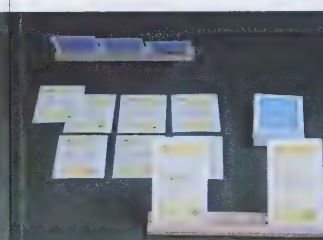
MUSICIANS



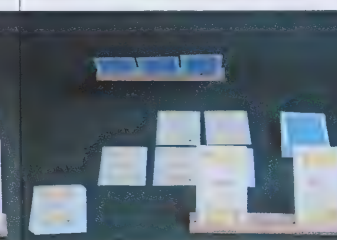
Each category has a symbol that helps identify it. The game could be played by matching non-linguistic cues, if the person with aphasia was to have severe reading impairments. For example, the category for musicians is a circle. There are 24 cards per category. Four cards have the same symbol and name. Every musician has a symbol.



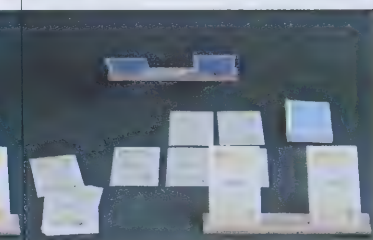
To start,
one player distributes 3 cards (facing down) per player, and places 6 cards facing up on the table. The rest of the cards remain on the deck.



The first player checks to see if one of the cards in the rack matches a card on the table. If it does, the cards are read aloud.
If the player does not have a card to match, s/he gets rid of one of the cards on hand, and places it with the cards on the table.



The matched cards are placed facing up, making a personal deck close to the player.



It is now the other player's turn, who can match a card on the table, OR the card on top of the other player's deck.

The game ends when all the cards have been used up. The player with the biggest deck wins.

Appendix G Ethics applications

University of Alberta
Faculty of Arts, Science & Law. Research Ethics Board

Application to conduct research involving human participants

PRINCIPAL INVESTIGATOR

Name F. Guillermina Noël

Department/Faculty Art and Design, Faculty of Arts

Campus Address 3-71 Fine Arts Building

Campus Phone number 492 7877

E-mail address fnoel@ualberta.ca

SUPERVISOR

Name / Department of Faculty Supervisor Bonnie Sadler Takach, Art & Design

Supervisor's E-mail address bbs@ualberta.ca

Supervisor's Campus Phone number 492 7859

PROJECT TITLE

Communication design and Broca's Aphasia

Stage I: Expert Interview

Funding Source(s) None

Communication Design and Broca's Aphasia

Summary

This research project deals with the use of visual communication design to contribute to the everyday life of a specific patient with Broca's aphasia. Aphasia is a communication disorder caused by brain damage (stroke, brain injury, brain tumors, head trauma, Alzheimer, infections related to the brain area, etc.) that affects language: speaking, reading, writing and listening. The number of people that suffer from aphasia in Canada has been estimated to be about 100,000. Aphasia can have a devastating effect on the individual's life and his / her entire family.

In general, individuals with Broca's aphasia have their speech reduced to a few words which are produced with effort, and the right side of the body could be paralyzed, affecting writing. They are no longer able to have the life that they used to have, they are not able to perform the activities that they used to perform. Their inability to speak prevents them from engaging in conversations, causing them frustration and isolating them from family activities.

Communication is seen as an integral part of the execution/involvement of life events. Therefore, the National Joint Committee for the Communicative Needs of Persons with Severe Disabilities defines communication as "a basic need and basic right of all human beings."

Chapey, R. & Hallowell, B. (2001). Introduction to Language Intervention Strategies in Adult Aphasia. In Chapey, R. (ed.), *Language Intervention Strategies in Aphasia and Related Neurogenic Communication Disorders* (pp. 3–17). Philadelphia, PA: Lippincott Williams & Wilkins.

The main purpose of my project is to design a system of games that could help provide a specific individual with Broca's aphasia with tools to facilitate interaction with others.

The design of the games needs to be customized in order to adapt to the specific case being addressed, that is, to the patient's interests, needs, level of disabilities, educational level, etc. The case in this study will be my stepfather. The "Questions and Answers" game prototype (shown on Appendix C), is one in a series of games being developed to facilitate family interaction, while promoting motivation and reducing frustration. Similar approaches, to the use of colour, typeface, format, layout, etc., will be applied in the design of a picture/word domino game and a name-matching card game.

Research Design

This project will be developed in three stages.

*1. EXPERT INTERVIEW

The first stage involves interviews with experts in aphasia, visual communication design, and educational psychology.

2. PROTOTYPE TESTING WITH PEOPLE WITHOUT APHASIA

The second stage consists of testing the performance of game prototypes with players who do not have aphasia (graduate students from the University of Alberta).

3. PROTOTYPE TESTING WITH AN INDIVIDUAL WITH APHASIA

The third stage involves testing the prototypes of the games with my stepfather, an individual with aphasia, should he be able to participate at the testing time.

*** At this moment I am requesting authorization to conduct the expert interviews.**

The information collected will allow me to finalize the prototype, design and methodology for the second and third stages. I will then submit my next ethics application for the second and third stages.

Assessment of Risk to Human Participants

I believe that little risk is involved to the experts I interview, at least no more than what could be involved in any University seminar course or discussion with a supervisor. The experts I will meet are adult and have agreed to meet with me, and evaluate the design of my prototypes. Their participation will be requested by email. Two experts in aphasia have agreed to meet with me later this month, Dr. Marjorie Nicholas (Boston), and Dr. Roberta Chapey (New York). Experts will select the day, time, and place of the meetings for their convenience. Each interview will last approximately one hour.

I will show the experts prototypes for games I have developed and I will ask them for critical evaluation of aspects such as: the activity; the idea of customization; the content of the material; the format; the layout; colour; text; and the project; etc. I include representations of the game "Questions and Answers" in the Appendix section. I will give each expert a letter signed by me noting that I intend to use their advice, and if I use the content of their comments in my thesis, or cite any portion of our conversations in my thesis, or mention their name in any way I will submit the draft text to them requesting their approval.

I will not record my interviews in any way other than making notes as we go. I will not take pictures of them.

I am requesting an interview with other experts in Rehabilitation Medicine,

Visual Communication Design, and Educational Psychology; with a view to meeting them in September, October and November of this year, in Europe and Argentina.

Description of Procedures to be Undertaken to Reduce Risk

BOOKLET

The content of the booklet was mainly developed as part of one my courses, and it was approved by my supervisor Bonnie Sadler Takach. This material is intended to facilitate the experts' understanding of the project, and the game prototype I will be showing to them.

INTERVIEW (SEMI-STRUCTURED)

The questions of the interview are focused on the potential performance of the "Questions & Answers" game prototype, and I am asking the experts to respond, according to their research and experience. For example, I am asking Dr. Chapey and Dr. Nicholas to respond according to their experience treating patients with Broca's aphasia.

DATA COLLECTION

The data from the interviews will be collected in the form of written notes. The conversation will not be recorded, nor will pictures be taken.

The data collected will be analysed and as appropriate used as feedback to improve the design of the system of games. If it is necessary to quote some of the experts, after drafting the text I will ask them for permission.

Detailed Proposal

Literature on aphasia highlights the important role that significant others play in the patient's recovery. It is the family member who will help the patient satisfy her/his needs. It is the caregiver who will provide information to anybody concerned, about interests, abilities, educational level and other background information related to the patient.

The uniqueness of each aphasia case is a very well known fact among specialists. Given the generalized agreement among specialists about the importance of customization in this area, I will develop the project centered on a specific case, with which I am familiar, my stepfather.

Frustration and lack of motivation are other issues that have been observed in readings on the subject, and are two aspects that worry clinicians. The activities must be designed and sequenced according to the individual's profile to avoid failure and consequent frustration.

The action of playing is a significant function in humans. Play has been used in therapy to help individuals cope with disabilities and adjust to life events. Games are used in rehabilitation, as a way to organize group activities, allowing adults to interact with others.

The "Questions and Answers" game prototype (shown on Appendix C), is one in a series of games to be designed to facilitate family interaction while promoting motivation and reducing frustration. It was also customized in order to adapt to the specific case being addressed, that is, to the patient's interests, needs, level of disabilities, educational level, etc.

The patient

In December 2002 MP, my stepfather, suffered a stroke, and in February 2003 he suffered another one; as a result, he suffers from Broca's aphasia. His speech is reduced to a few words which are produced with effort. His auditory comprehension is good. MP is able to talk on the phone answering with brief sentences (e.g., "hello," "I feel fine"). Writing is affected, he is not able for example to sign a form, but he is able to make some marks. His reading comprehension is in general good, he is able to read the titles in the newspaper, but not a complete article. MP's ability to communicate through gestures has been; lost.

Why my stepfather

When MP was still in hospital I developed 42 Icons to help him to communicate. The fact that I am a designer motivated him to use the icons. He has been my

stepfather for 20 years, we admire, trust, and love each other. Given that I know him well facilitates the process of customization of the design. Working with him will provide a model for designing customized games for other individuals with aphasia and their family and friends. Otherwise, I would have to go through a lengthy process of familiarizing myself with another patient and another family. In this way the risks are minimized, for both the family and the individual with aphasia.

FIRST STAGE / Expert Interviews

At the beginning of this stage I will meet with Dr. Marjorie Nicholas and Dr. Roberta Chapey, two leading experts in the field of aphasia, in order to ask them for advice and opinions about my intended approach. Their participation was requested by email (attached). I will take with me a prototype for the "Questions & Answers" board game that I have developed (see Appendix C) in response to research in the following areas:

- *Aphasia*, in relation to treatments, group treatments, social interaction group treatment, family activities, and more specific aspects related to the disorder, like Broca's aphasia, reading impairments, and neuropsychiatric aspects;
- *Visual communication design*, in relation to reading, designing for the visually handicapped, and legibility;
- *Educational psychology*, in relation to games, family play therapy, and play therapy;
- *Game theory*, in relation to general aspects of games, conflict resolution, and philosophical aspects. I will ask the experts for their reactions. A booklet (enclosed) to introduce the project will be sent in advance, as well as a set of questions (attached). This will provide them with an overview of my project, and will facilitate the interview.

In the months of September and October, I plan to meet with other experts in Europe. Dr. Rosemary Sassoon (typographer and researcher in the area of agraphia); Sue Gilpin (speech therapist); Karel van der Waarde (information designer) and Paul Mijksenaar (information designer). In Argentina, during the month of November, I plan to meet, Ronald Shakespear (visual communication designer), Rubén Fontana (visual communication designer), and Dr. Ana Atallah (neurologist). There may be additional experts that I will contact.

Appendix A

Letters

e-mail sent to Dr. Roberta Chapey

Dear Roberta Chapey:

My name is Guillermina Noël, I am 32 years old and I live in Canada. I have been working in visual communication design since 1997.

In September 2003, I started my Visual Communication Design Master Program at the University of Alberta, and decided to work in the design of visual aids for people with Broca's aphasia. In the first year of my program I have identified three possible areas for a design intervention: a) the area of diagnosis of aphasia, b) the area of rehabilitation of aphasia, and c) when the patient returns home or to a care facility. This is the area where I thought I could contribute. When people with aphasia return home, one of the main problems confronted is the lack of communication ability, and the negative impact this has on their life with their families. I thought that a board game could be designed as a tool to facilitate family interaction, and developed a game prototype as part of one of my courses.

I am now starting my Master thesis; and I think that a game (no a computer game) can be a tool to facilitate family interaction, and that playing can be a good activity, not only to facilitate family interaction, but also to help the patient cope with a disability, and adjust to life.

I am not intending to design an alternative language system, and I am not intending to work in relation to computers. I am intending to develop a system of games (a domino, a board game and a card game) to help individuals with aphasia and their family to interact, to share an activity together. The use of games has been reported as a way to organize social interaction group therapy related to speech pathology. However, many times the games used in therapy, are not designed considering the situation of patients with aphasia. What is worst, sometimes these are games for children, and this can have negative consequences, such as feeling underestimated in one's intellectual development.

Your book has been extremely useful for my understanding of aphasia, and for the development of my previous work. I would like to see you to talk with you about my thesis project. I have arranged a visit with Dr. M. Nicholas in Boston for May 3. Would you be willing to make some time, about two hours, on the 4, 5, or 6 of May? If you would, I would travel to see you.

Please let me know if you would be willing to see me.

Looking forward to your response.

Guillermina Noël

Appendix A

Letters

e-mail sent to Dr. Roberta Chahey

Dear Roberta Chahey:

My name is Guillermina Noël, I am 32 years old and I live in Canada. I have been working in visual communication design since 1997.

In September 2003, I started my Visual Communication Design Master Program at the University of Alberta, and decided to work in the design of visual aids for people with Broca's aphasia. In the first year of my program I have identified three possible areas for a design intervention: a) the area of diagnosis of aphasia, b) the area of rehabilitation of aphasia, and c) when the patient returns home or to a care facility. This is the area where I thought I could contribute. When people with aphasia return home, one of the main problems confronted is the lack of communication ability, and the negative impact this has on their life with their families. I thought that a board game could be designed as a tool to facilitate family interaction, and developed a game prototype as part of one of my courses.

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Please let me know if you would be willing to see me.

Looking forward to your response.

Guillermina Noël

Appendix A

Letters

e-mail sent to Dr. Marjorie Nicholas

Dear Dr. M. Nicholas:

My name is Guillermina Noël, I am 32 years old and I live in Canada. I have been working in visual communication design since 1997.

Two days ago I send this letter by e-mail to Dr. Nancy Helm-Estabrooks, and she suggested that I should contact you. Here is a little of background:

In September 2003, I started my Visual Communication Design Master Program at the University of Alberta, and decided to work in the design of visual aids for people with Broca's aphasia. In the first year of my program I have identified three possible areas for a design intervention: a) the area of diagnosis of aphasia, b) the area of rehabilitation of aphasia, and c) when the patient returns home or to a care facility. This is the area were I thought I could contribute. When people with aphasia return home, one of the main problems confronted is the lack of communication ability, and the negative impact this has on their life with their families. I thought that a board game could be designed as a tool to facilitate family interaction, and developed a game prototype as part of one of my courses.

I am now starting my Master thesis; and I think that a game (no a computer game) can be a tool to facilitate family interaction, and that playing can be a good activity, not only to facilitate family interaction, but also to help the patient cope with a disability, and adjust to life.

I am not intending to design an alternative language system, and I am not intending to work in relation to computers. I am intending to develop a system of games (a domino, a board game and a card game) to help individuals with aphasia and their family to interact, to share an activity together. The use of games has been reported as a way to organize social interaction group therapy related to speech pathology. However, many times the games used in therapy, are not designed considering the situation of patients with aphasia. What is worst, sometimes these are games for children, and this can have negative consequences, such as feeling underestimated in one's intellectual development.

The three books of Dr. Nancy Helm-Estabrooks, *Approaches to the Treatment of Aphasia*; and the two versions of *Manual of Aphasia* (1991, 2004), were extremely useful for me. To develop the project for my Master thesis, I thought it will be

Appendix A

Letters

e-mail sent to Dr. Marjorie Nicholas

very good to have the chance to meet with Helm-Estabrooks, and she suggested as I mentioned at the beginning of the letter, to contact you.

Would you be willing to make some time, about two hours, on the 2 or 3 of May? If you would, I would travel to see you.

Please let me know if you would be willing to see me.
Looking forward to your response.

Guillermina Noël
Graduate Student
Department of Art + Design
University of Alberta

fnoel@ualberta.ca

Appendix A

Letter of agreement

April, 2005

Dear [Expert],

In accordance with the University of Alberta policies about ethics in research and their guidelines, I would like to let you know that if I were to cite any portion of our conversation in my thesis, or mention your name in any way I will submit the draft text to you requesting your approval prior to inclusion in my final thesis version.

Guillermina Noël

Graduate Student

Department of Art + Design

University of Alberta

fnoel@ualberta.ca

(780) - 432 22 10

Appendix B

Expert Interview
Semi-structured questions

About the activity

- 1) What do you think about game playing as an activity to facilitate family interaction for an individual with Broca's aphasia?
- 2) Do you think that it is a good idea to develop an activity that the individual with Broca's aphasia and his/her family can share together? Why / Why not?
- 3) Could the activity be beneficial? Why / Why not?
- 4) How long do you think the activity should last? Why?
- 5) Do you have any other comments about the activity?

About the idea of customization

- 6) What do you think about the idea of customizing a tool for a specific individual? Is that a benefit, or does it really matter? Why?
- 7) Do you think that having the names of the family members of the patient is an advantage? Why?
- 8) Do you have any other comments about the idea of customization?

About the content

- 9) If we look at the *complexity* of the text, which of the two examples do you think will be more appropriate for an individual with Broca's aphasia? Why?
- 10) If we look at the *length* of the text, which of the two options do you think will be more appropriate for an individual with Broca's aphasia? Why?
- 11) Do you have any other comments about the content?

About the format

- 12) Do you think that the size of the cards is appropriate and easy to hold for an individual with Broca's aphasia? (weak right side). Why / Why not?

Appendix B

Expert Interview
Semi-structured questions

13) What about the board game, is the size appropriate? Do you think that the racks are a good idea? Why / Why not?

14) Do you have any other comments about the format?

About the layout

15) Which of the two arrangements of the text do you think will facilitate the individual's comprehension of the text?

16) Which of the differences is in your judgement an advantage:
lighter colour; highlighted "question" (band); typeface choice; emphasized punctuation marks, shortened text, chunked text, two typographic variables instead of three; or all of the above? Why?

17) Considering that the person suffers from agrammatism, will it be better for example to avoid the use of articles, or is it good to include them in the sentence? Why?

18) According to your experience, will the "linguistic" separation of words help to the individual's comprehension of the text? Why?

19) Do you have any other comments about the layout?

About colour

20) Is the colour palette appropriate for this purpose? Does this matter? Why / Why not?

21) Do you believe that colour could help the individual to match question and answer? Why?

22) Which of the two options is more appropriate, the softer or the brighter palette? Why?

23) Do you have any other comment about the colour?

About the pattern

24) Is the pattern appropriate for this purpose? Does this matter? Why / Why not?

Appendix B

Expert Interview
Semi-structured questions

25) Do you think that the pattern could help the individual to match question and answer? Why / Why not?

26) If you were one of the players without aphasia, would the pattern be useful for you? Why / Why not?

27) Do you have any other comment about the pattern?

About the text

28) If you were one of the players without aphasia, which of the two examples do you think would be easier to read? Why?

29) Do you have any other comment about the text?

About the project

30) What do you think about this research project?

31) Do you have any other comment?

THANKS!

Similar questions will be asked regarding prototypes of the picture/word domino game and the name–matching card game, where the information gathered from expert interviews will be applied.

Appendix C

“Questions and Answers” game prototype

Figure 1. Board game



Figure 2. View of the cards showing the colours and the 12 patterns designed.



Appendix C

"Questions and Answers" game prototype

Figure 3. One of the steps showing the racks, and the board in use

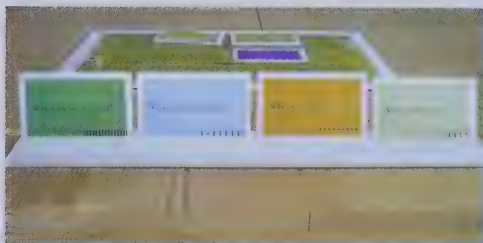
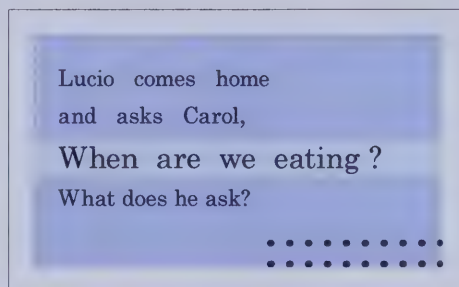
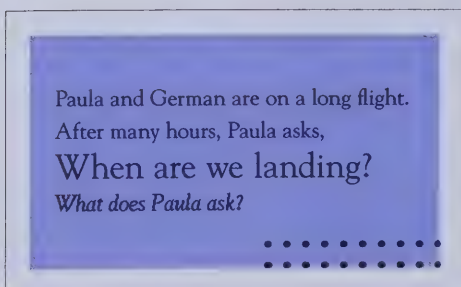
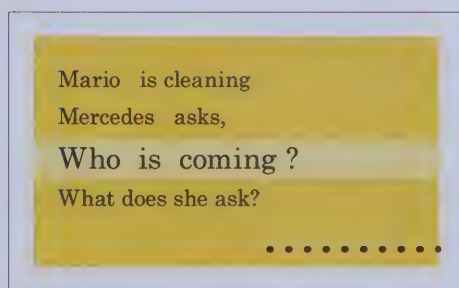
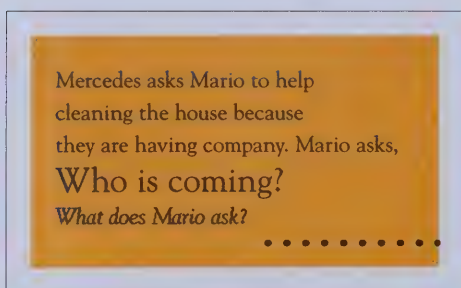


Figure 4. Example of the two different design of cards (left and right).

The game has 12 Question cards, and 12 Answer cards. In this case, just two question cards are shown. Many questions that I will ask the experts will focus on the two different approaches to the design of the cards.





UNIVERSITY OF ALBERTA

Arts, Science & Law Research Ethics Board (ASL REB)

Certificate of REB Approval for Fully-Detailed Research Proposal

Applicant: Guillermina Noel

Supervisor (if applicable): Dr Bonnie Sadler-Takach

Department / Faculty: Faculty of Arts-Department of Art & Design

Project Title: Communication Design and Broca's Aphasia: Stage I Expert Interviews

Grant / Contract Agency (and number):

ASL REB Member (and file number if applicable): LKP (Chair)

Application number: #881

Approval Expiry Date: April 14, 2006

CERTIFICATION of ASL REB APPROVAL

I have reviewed your application for research ethics review and conclude that your proposed research meets the University of Alberta standards for research involving human participants (GFC Policy Section 66). On behalf of the *Arts, Science & Law Research Ethics Board (ASL REB)*, I am providing expedited research ethics approval for your proposed project.

Expedited research ethics approval allows you to begin your research with human participants, but is conditional on the full ASL REB approving my decision at its next meeting (*18 April 2005*). If the full ASL REB reaches a different decision, requests additional information, or imposes additional research ethics requirements on your study, I will contact you immediately.

If the full ASL REB reverses my decision, and if your research is grant- or contract-funded, the Research Services Office (RSO) will also be informed immediately. The RSO will then withhold further funding for that portion of your research involving human participants until it has been informed by the ASL REB that research ethics approval for your project has been granted.

This research ethics approval is valid for one year. To request a renewal after (*April 14, 2006*), please contact me and explain the circumstances, making reference to the research ethics review number assigned to this project (see above). Also, if there are significant changes to the project that need to be reviewed, or if any adverse effects to human participants are encountered in your research, please contact me immediately.

ASL REB member

Date:

14A

University of Alberta
Faculty of Arts, Science & Law. Research Ethics Board

Application to conduct research involving human participants

PRINCIPAL INVESTIGATOR

Name F. Guillermina Noël

Department/Faculty Art and Design, Faculty of Arts

Campus Address 3-71 Fine Arts Building

Campus Phone number 492 7877

E-mail address fnoel@ualberta.ca

SUPERVISOR

Name / Department of Faculty Supervisor Bonnie Sadler Takach, Art & Design

Supervisor's E-mail address bbs@ualberta.ca

Supervisor's Campus Phone number 492 7859

PROJECT TITLE

Communication design and Broca's Aphasia

Stage 2: Informal Conversation

(Stage 1: Expert Interview; attached for your information.

Application number: #881)

Funding Source(s) None for this stage

Research Design

This project is being developed in two stages.

1. EXPERT INTERVIEW

*2. INFORMAL CONVERSATION

The second stage involves having an informal conversation with the user of the game (my stepfather) about the project and the prototype for the game "Questions and Answers." His feedback will be included in the research report.

As it was mentioned in the first stage of the Ethics Application submitted in April 2005, the thesis is based on my stepfather's experience as a patient with Broca's aphasia. It was also mentioned that I was intending to test the prototype with him. However, as time went by, I did not consider appropriate to do it. In my opinion he associates a testing situation with therapy, and therapy was a frustrating and humiliating experience for my stepfather. Nevertheless, I think his opinion and advice about what I am doing are fundamental to my understanding of the design requirements.

***As indicated in the Ethics Application submitted in April 2005, I am requesting authorization to conduct a second stage. The information collected will allow me to finalize the prototype, and confirm doubts and uncertainties related to the design of the prototype.**

Assessment of Risk to Human Participants

The meeting will take place in the house of the participant, my stepfather, located in the city of La Plata, province of Buenos Aires, Argentina.

My stepfather is the only participant with Broca's aphasia included in this project, using as it is suggested in the GFC Policy Manual, Section 66, the smallest number of human participants that shall provide valid data.

The risk to the user of the design prototype participating in the conversation is minimal, and is not different from other conversations we may have during my visits to him. The participant knows about the project, what I am doing, every time I meet with my supervisor, he is informed about the experts I have consulted, and we have already talked about some aspects of the project. I do not see any risk to the participant or his status by using his opinion in the body of my thesis work. There is no deception involved.

Regarding respect for the exercise of individual free and informed consent, I will ask the participant, my stepfather, for authorization to include his opinion in the project. Given that he is not able to sign (the right arm is weak), and that he does not understand, speak or read any other language than Spanish, and in

order to avoid making him feel humiliated (by for example taking a picture of him while he points to the word “yes” or “no”) I will ask my stepfather for verbal consent. Concerning privacy, his real name will not be mentioned in the thesis document.

The participant will be appropriately informed that he is completely free to refuse to participate and say: “no,” or to withdraw at any point during the conversation. He will also be informed that he has the right to refuse the idea of including his opinion in the final document.

Description of Procedures to be Undertaken to Reduce Risk

CONVERSATION CONTENT

The conversation will be focused on the potential performance of the “Questions & Answers” game prototype, and not on the participant’s performance, and I will be asking him to respond according to his experience and opinions.

Although the researcher will be asking similar questions to the ones presented in the questionnaire for the Expert Interviews, the structure of the questions will be simplified. Considering the participant’s language impairment, the researcher will summarize the questions, and pose them in a way that he could answer by “yes” or “no,” thus, avoiding my stepfather’s feelings of embarrassment or helplessness if I asked him to provide further explanation. While he has difficulty expressing some concepts, he has no problem understanding them. Each question conveys an idea: Do you think that the size of the cards is appropriate? The answer could be “yes,” “no,” gestures, or a brief sentence.

DATA COLLECTION

The data from the meeting will be collected in the form of written notes. The conversation will not be recorded, nor will pictures be taken.

Since the idea is to have a natural conversation, notes will not be taken during the meeting, helping my stepfather feel comfortable.

His opinions will be used as feedback to improve the design of the game, they will be included in the Master of Design thesis report, the corresponding exhibition, and future presentations or publications.

Description of the benefits

The inclusion of my stepfather’s opinions in the report is socially important. This could help other individuals and families with aphasia. He could have an occasion to show his abilities and his judgement. His opinions could confirm, challenge or reveal new aspects not mentioned in the interviews by the experts.

It would be a benefit to me; he could provide new insights into how to improve the game, what is appropriate or inappropriate, and what is relevant and what is not. I strongly believe that the experience could be beneficial to other researchers in areas of both aphasia and design.

Detailed Proposal

Please, see Stage 1 of the Ethics Application approved in April 14 2005.

The patient

Please, for detailed information about the participant, see Stage 1 of the Ethics Application (completed; attached here for your information).

Why my stepfather

Please, read the reason why my stepfather is the main subject of this research project in the Stage 1 of the Ethics Application.

SECOND STAGE / Informal Conversation

I will visit the house of my stepfather, with his consent, to have a short conversation. The conversation will last about 35 minutes, given that people with Broca's aphasia get tired very easily.

The purpose of the visit is to show the participant the game prototype, and talk about the idea of playing to facilitate family interaction. I will briefly introduce how the game is played (10 minutes), and we will then after have a conversation (25 minutes). I intend to explain to him some design decisions about the size of the board and cards, the use of racks to avoid using the weak right arm, the colors used, the typeface used and its sizes, to know his opinions. If my stepfather were to agree, I will include his opinion in the thesis document.

I intend to include stepfather's responses along with my comments about a topic. An example I will include could be:

"Do you think that using the family names is a good idea? He said: 'Of course!' I asked 'Do you think this is important?' He said: 'Yes.' He seemed to be pleased about the idea of having the names of his family members in the cards."

I have read the *University of Alberta Standards for the Protection of Human Research Participants* [GFC Policy Manual, Section 66] and agree to abide by these standards in conducting my research.



UNIVERSITY OF ALBERTA

Arts, Science & Law Research Ethics Board (ASL REB)

Certificate of REB Approval for Fully-Detailed Research Project

Applicant: Guillermina Noel

Supervisor (if applicable): Bonnie Sadler Takach

Department / Faculty: Faculty of Arts, Department of Art and Design

Project Title: Communication Design and Broca's Aphasia Stage 2

Grant / Contract Agency (and number):

(ASL REB member) **Application number:** LKP #1168

Approval Expiry Date: April 7, 2007

CERTIFICATION of ASL REB Approval

I have reviewed your application for ethics review of your human subjects research project and conclude that your project meets the University of Alberta standards for research involving human participants (GFC Policy Section 66). On behalf of the *Arts, Science & Law Research Ethics Board (ASL REB)*, I am providing expedited approval for your project.

Expedited research ethics approval allows you to continue your research with human participants, but is conditional on the full ASL REB approving my decision at its next meeting (*April 24, 2006*). If the full ASL REB reaches a different decision, requests additional information, or imposes additional research ethics requirements on your study, I will contact you immediately.

If the full ASL REB reverses my decision, and if your research is grant or contract funded, the Research Services Office (RSO) will also be informed immediately. The RSO will then withhold further funding for that portion of your research involving human participants until it has been informed by the ASL REB that research ethics approval for your project has been granted.

This research ethics approval is valid for one year. To request a renewal after (*April 7, 2007*), please contact me and explain the circumstances, making reference to the research ethics review number assigned to this project. Also, if there are significant changes to the project that need to be reviewed, or if any adverse effects to human participants are encountered in your research, please contact me immediately.

ASL REB member (name & signature): Dr L

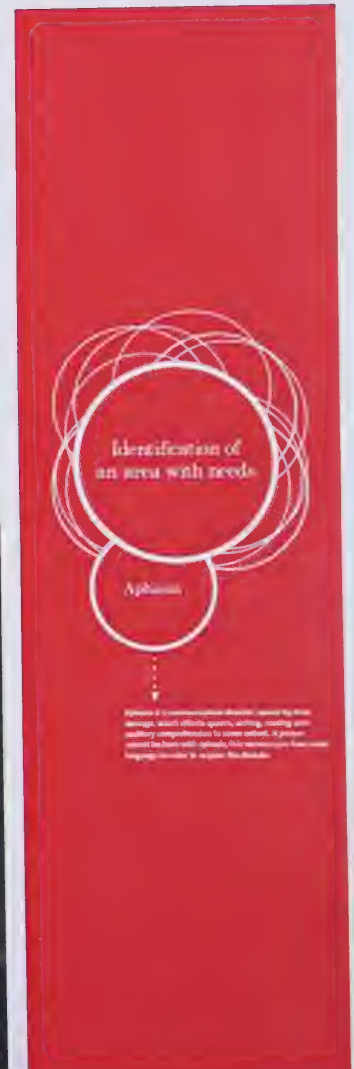
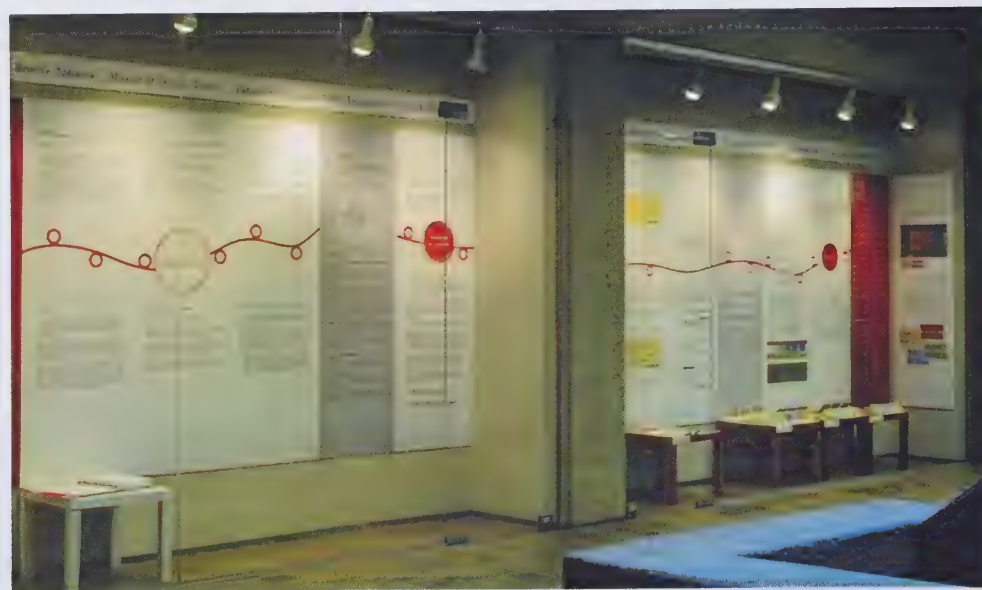
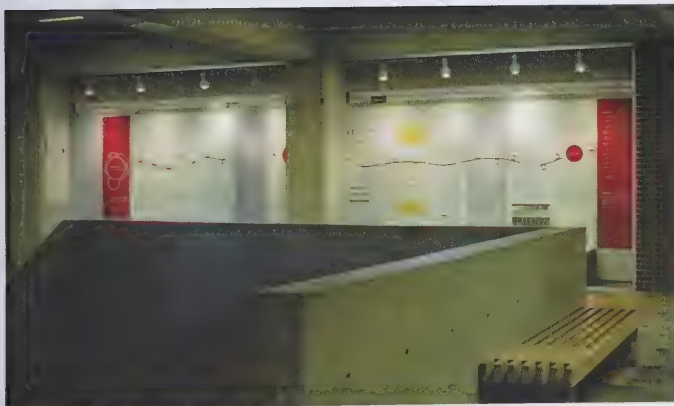
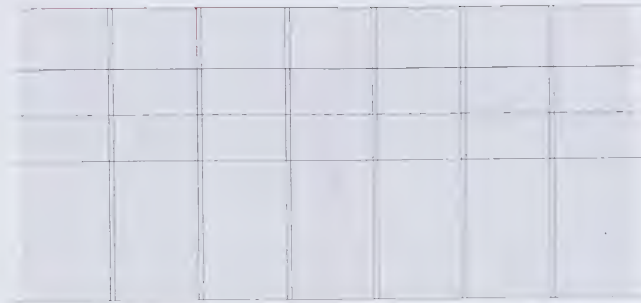
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Appendix H **Visual presentation**

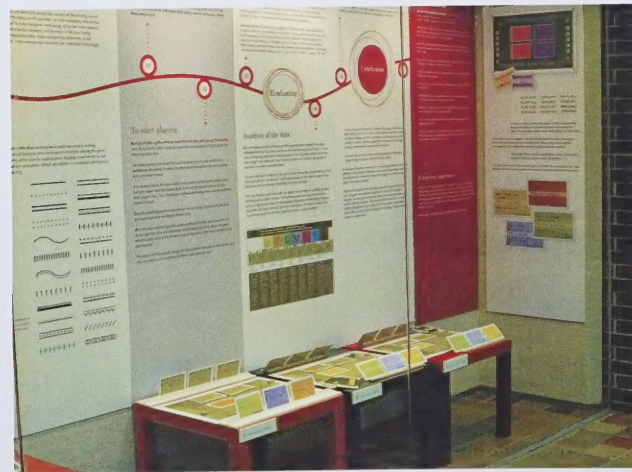
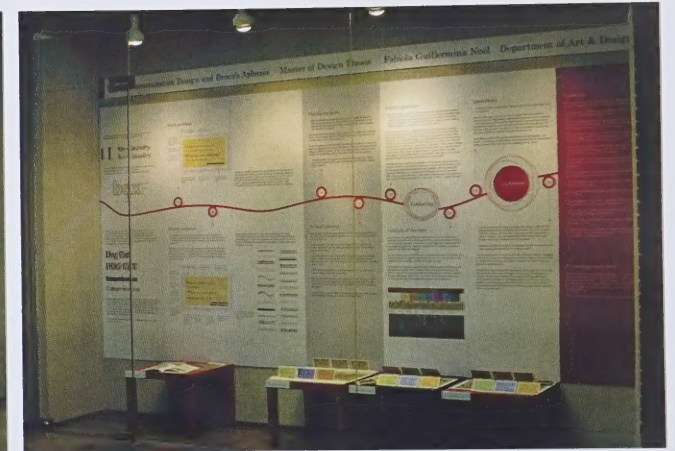
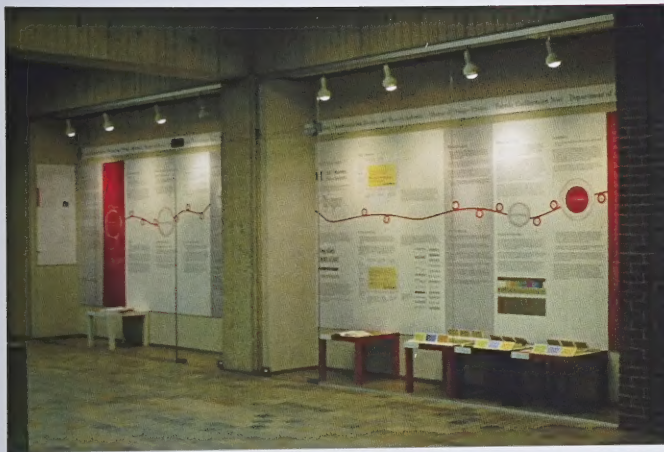
Visual presentation

Displayed in the second floor of the Fine Arts Building at the University of Alberta, the visual presentation was designed with the intention to show the design process followed in the thesis project. The main steps in this process were: identification of an area with needs, definition of the problem, research questions, designing the response, evaluating the prototypes, conclusions, guidelines; and towards the future.

The display's grid has seven columns, each of a height of 191 cm, and a width of 54.5 cm.



Visual presentation



OCT 02 2008

